THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXVII. No. 1983.] LONDON, MAY 14, 1901. [53RD YEAR. PRICE 6d.

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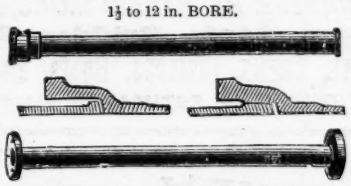

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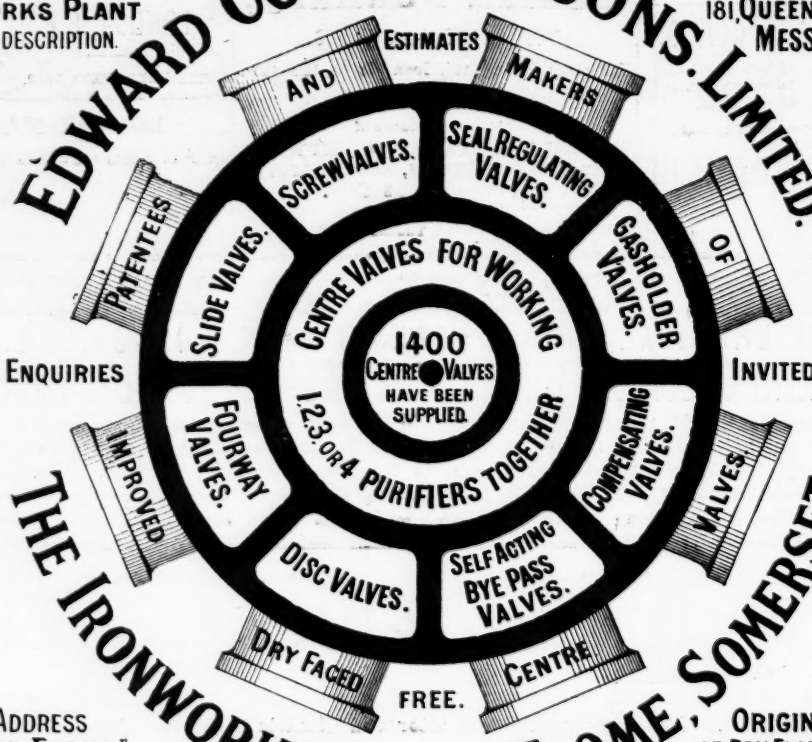

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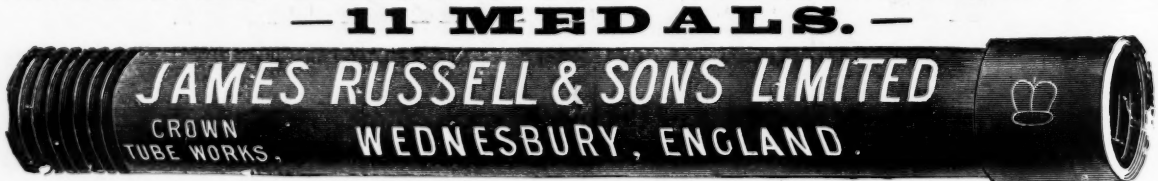

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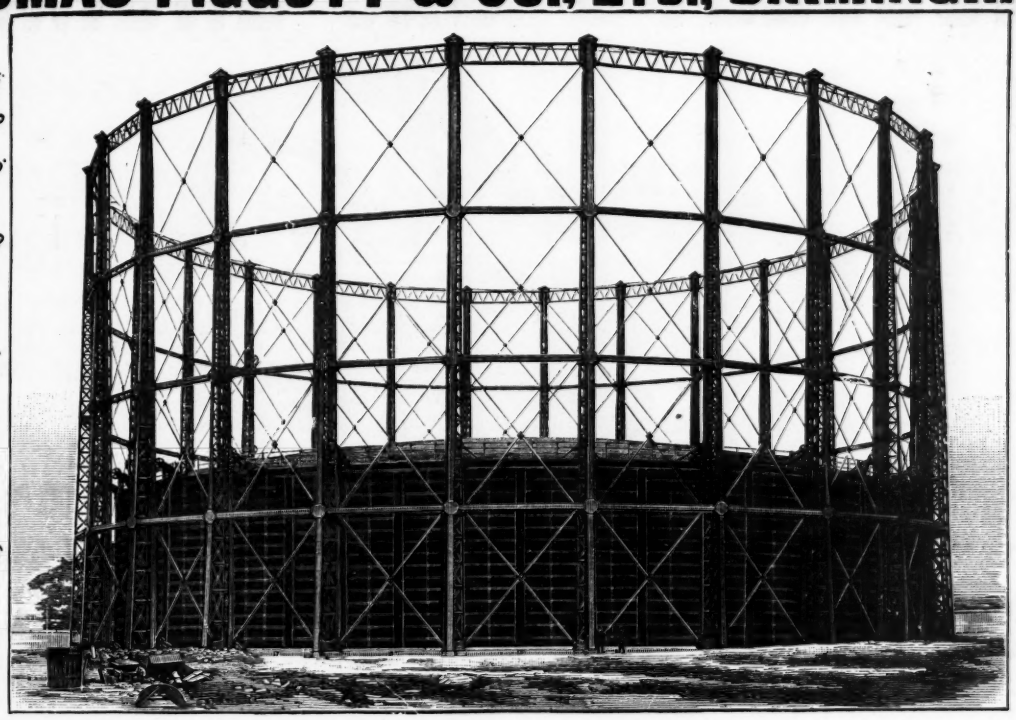

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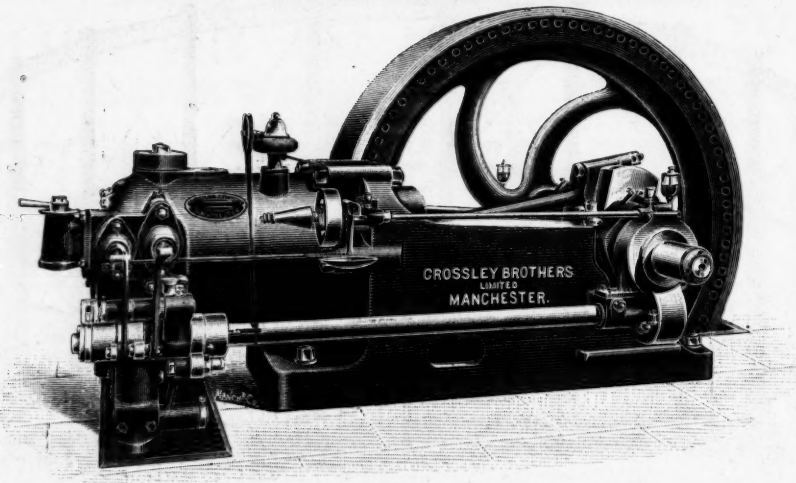

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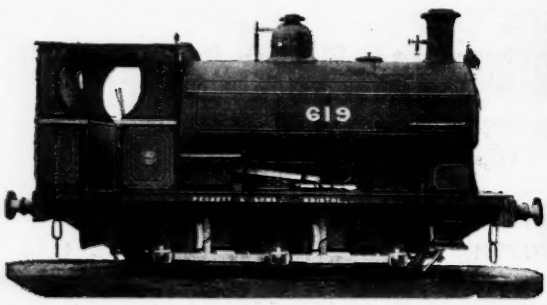

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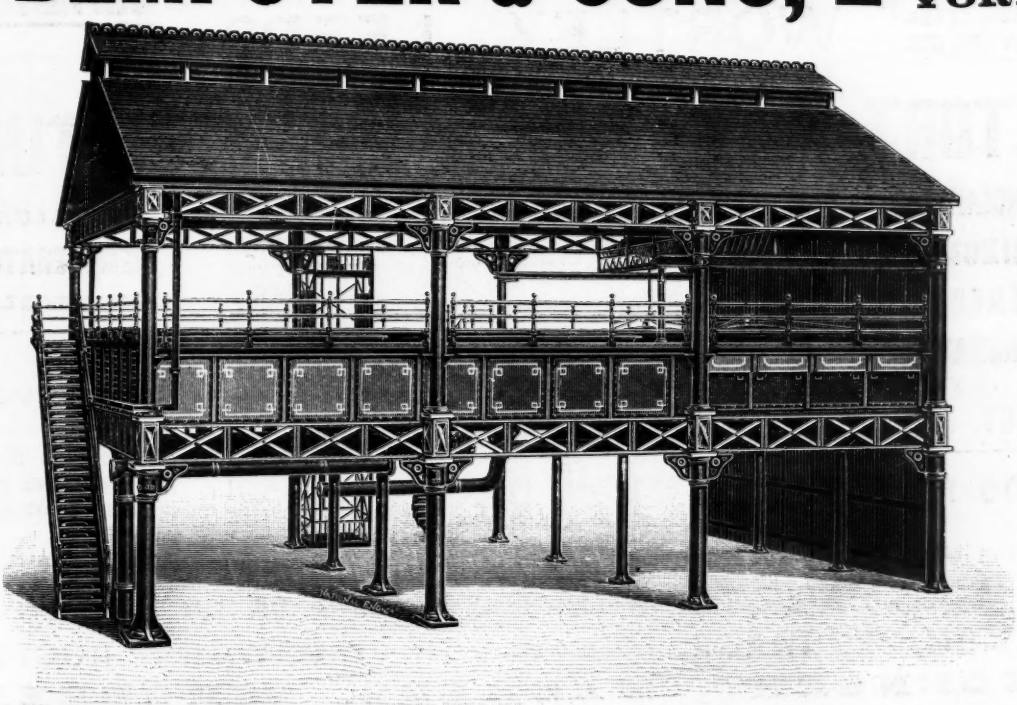

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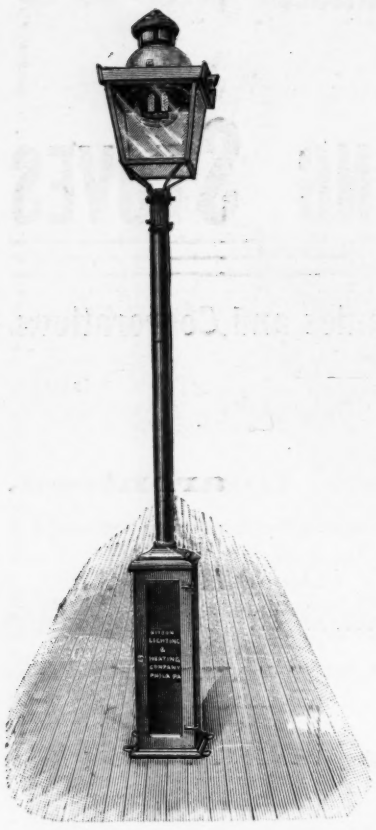

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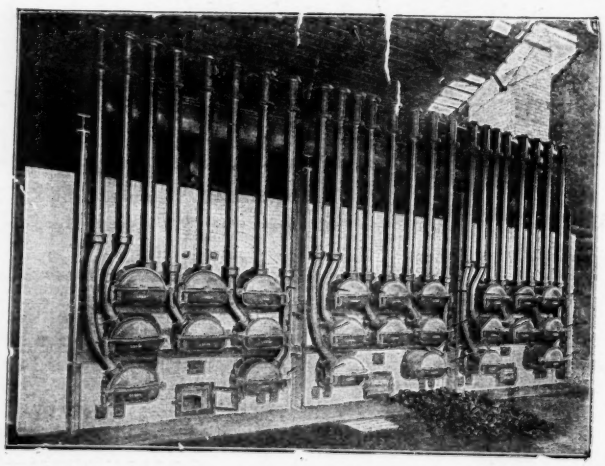

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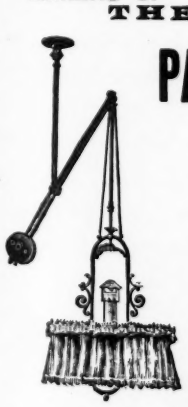

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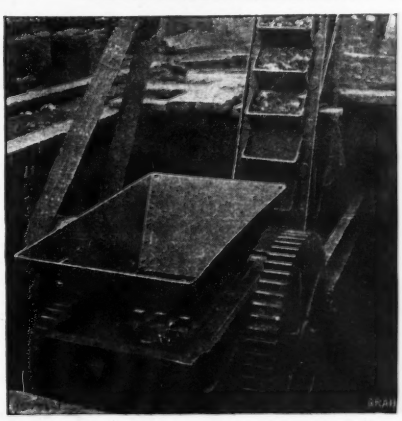

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which extract ALL the Ammonia and a large proportion of the CO_2 and H_2S.

Prevention of Slip of Gas Unwashed.
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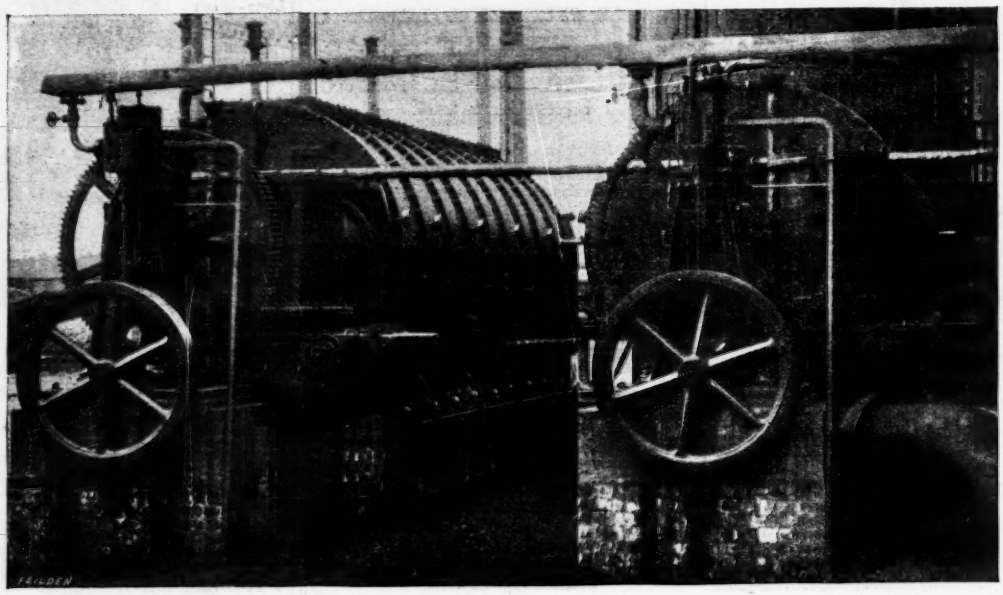

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Easy access to interior.

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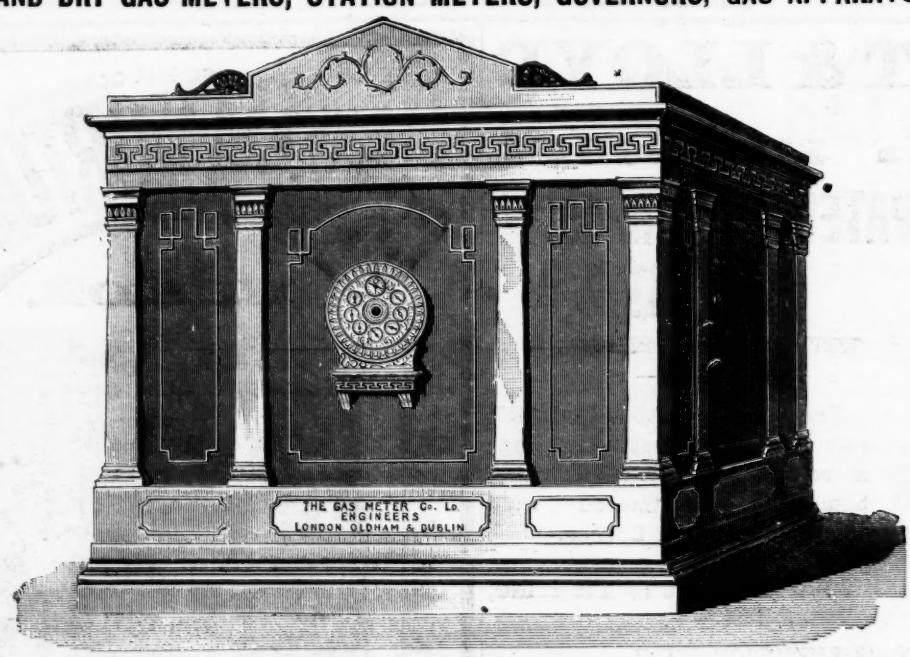

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SELF-INTENSIFYING LAMP.

Automatic Action.

No Complex Mechanism.

"Power" Free of Cost.

TYPE OF SCOTT-SNELL LAMPS
NOW IN USE
AT THE GLASGOW EXHIBITION.

INTENSIFIED LIGHT

WITHOUT Compressing Plant, Special Gas-Service, Water Bill, Gas-Engine or other Pumping Appliances, tearing up of Roadways, or interference with existing Service.

The **SCOTT-SNELL LAMP** may be set to give any pressure from 4 inches to 36 inches of Water; 8 inches to 10 inches is usually preferred.

400-CANDLE POWER OBTAINED FROM A SINGLE BURNER.

Lanterns supplied with Single, Duplex, or Cluster of Burners.

TO GAS ENGINEERS AND MANAGERS.

At the Stand on the North Bank of the Kelvin, an attendant will be pleased to give full explanation, and to show the action of the Lamp,

This unique Illustration of Wasted Bye-Products (heat in escaping products of combustion) effecting, without cost, all that is elsewhere reached by special motive power and special distributing Mains, should not be missed.

HIGH-PRESSURE LIGHTING HAS COME TO STAY.

Orders for Trial Lamps will, as far as possible, be executed in rotation.

The Lamps are being made by Automatic Machinery, similar parts interchangeable, minimum of hand labour.

THE LAMPS MAY BE INSPECTED AT ANY TIME BY APPOINTMENT.

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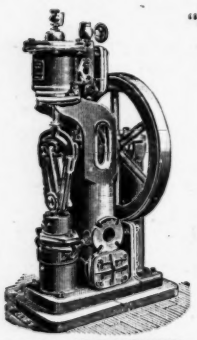

Fig. 705. "SINGLE RAM" STEAM-PUMP.

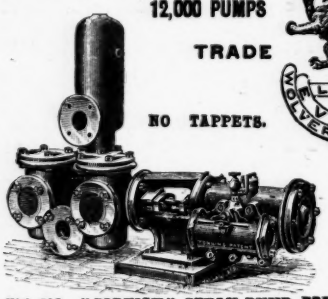

Fig. 808. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

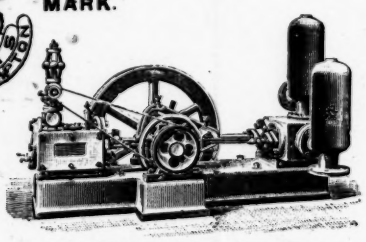

Fig. 688. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

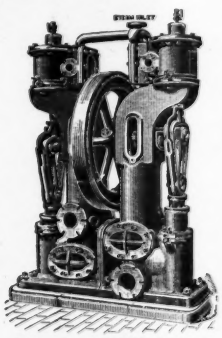

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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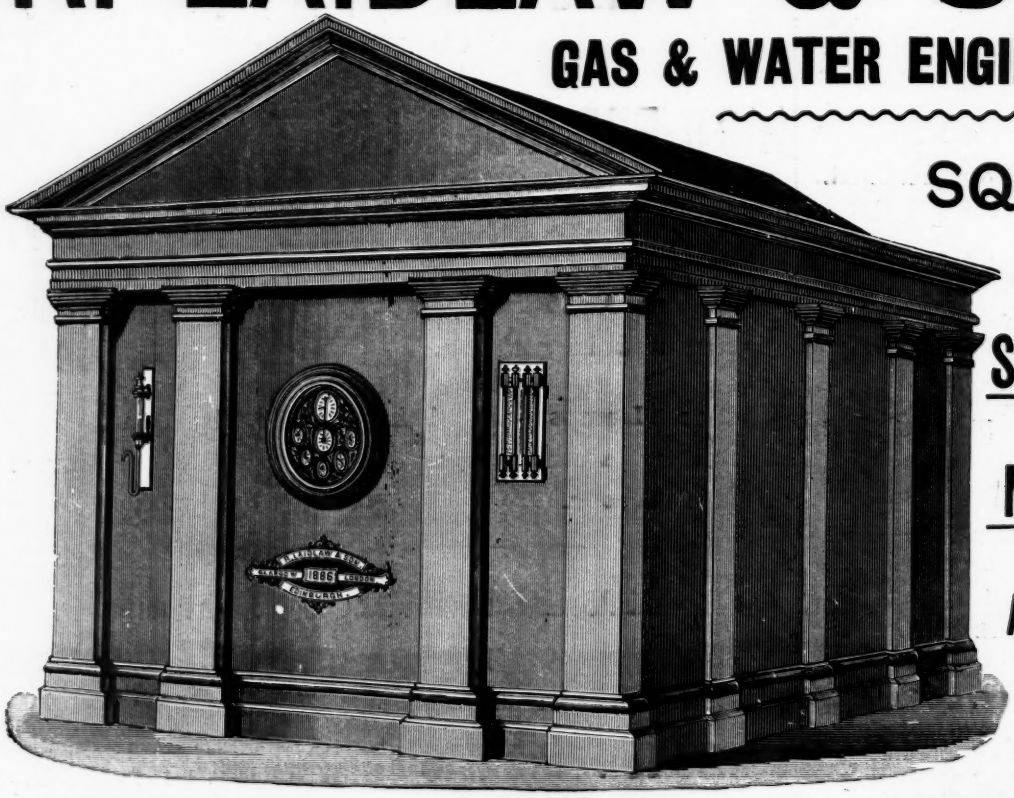

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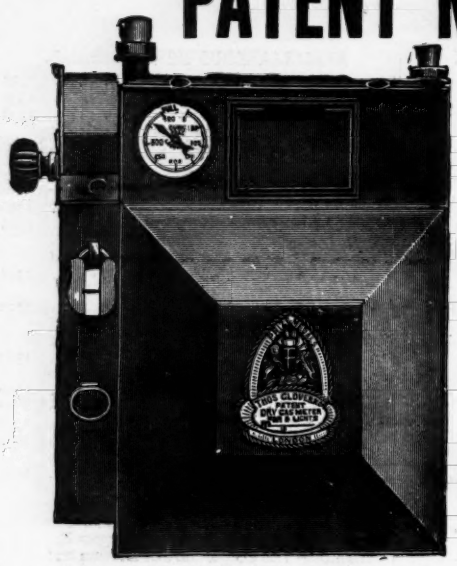

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JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

VOL. LXXVII., No. 1983.——TUESDAY, MAY 14, 1901.

EDITORIAL NOTES.

Coal Miners and the Position in the Coal Trade.

As we have from the very first thought would be the case, the threatened general sulk of the coal miners has come to nothing. On Wednesday last—the House of Commons having on the Monday approved the coal duty by a three-figure majority, and the Government candidate having been elected for Newport—the conference called by the Miners' Federation decided that it would be better to keep the substance than to grasp at the shadow. They saw clearly enough that neither the Government nor the House of Commons was to be frightened into moving from the course entered upon of imposing the 1s. duty, that public opinion everywhere was offended by their threat to defy the Executive, and that by stopping work they would be spending upon a futile demonstration the funds they have accumulated for the purpose of enabling them to fight for a larger "minimum" wage.

That such a struggle is contemplated by the men is made more than ever clear by the wording of the resolution adopted by the conference on Wednesday. The first part of it runs as follows: "The miners having been told by the Chancellor "of the Exchequer that the export tax on coal will be paid "by the foreign consumers, and that there are no reasons "why it should affect the workmen's wages, and believing "this to have been largely the reason why the House of "Commons went so strongly in favour of the tax, this con-"ference does not see its way clear to recommend a general "stoppage at this juncture. But we recommend that, if "any mining district is asked to submit to a reduction of "wages consequent upon the tax, a general conference be "called to consider and determine whether the whole of the "mines of the country shall be laid idle until such intimated "reduction is withdrawn. Notwithstanding, we still strongly "condemn this tax, and believe it will be used by the owners "to bring about a reduction in the wages of the miners." That practically amounts to a threat to strike against any proposed reduction in wages, for it will be open to the men to represent that such reduction is intended to make them bear any loss that their employers may have suffered through the operation of the tax; and the employers will be faced by the proverbial difficulty of proving a negative.

Yet it is perfectly obvious that those masters who do not pay wages under a sliding-scale have, or soon will have, a very good case for proposing a lowering of wages—quite apart from any question of the incidence of the export tax. Although the foreign trade last month shows, after allowing for there being one more working day in April this year than last, a small increase (say, 66,500 tons), that is quite an exception to the course of the export market since the beginning of the year; and decreases rather than increases are pretty certain to be the rule in the months to come. On the past four months, there has been a net decrease of 750,288 tons of coal sent abroad other than "bunkers," which show an increase of 368,209 tons. Moreover, while the quantity exported last month is slightly in excess of the quantities for the same month of the past two years, the value of those exported is calculated at more than 2s. per ton less than in 1900; the figures being 13s. 3½d. this year, as compared with 15s. 5d. the preceding April. The total value for the four months shows a falling off of £1,055,702, equal to just 10 per cent. on last year's figure.

In addition to this loss of orders from abroad, moreover, the coalowner has had to face a still more serious diminution of business at home; the two factors in combination having sufficed to bring the exorbitant prices previously enforced down with a run to somewhere about the level from which they started in 1899. The industries in which the slackness of business has been most apparent and most directly operative in breaking down coal prices, are the iron, steel, and engineering trades generally. Every now and again a more hopeful feeling is reported in these trades, but the hope has so far been persistently followed by disappointment; and the "slump" would seem to have come to stay. The situation in the engineering business is thus summed up in the leading journal of the iron trade: "The position "of the engineering trade continues far from satisfactory. "In some branches a state of absolute depression prevails; "while there is as yet no modification of the general com-"plaint among those firms who are fortunate enough to be "working full time, that the orders they have in hand "are being executed more rapidly than others are coming "in. The recent cheapening of certain items of raw "material seems to have had no other effect than to increase "the severity of competition and to bring prices down still "lower. The electrical and locomotive industries are about "the only branches that can be excluded from this some-"what gloomy summary. Both of them report crowded "order-books and full pressure." This state of affairs is clearly reflected in the Board of Trade returns for last month; the total exports of iron and steel being 25 per cent. less in April, and 33 per cent. less in the four months, than they were in the same periods of 1900.

There is, in fact, no possible doubt but that the collieries have had during some months past, and will have in the future, considerably smaller orders to share between them; and, competition growing more and more acute, prices will be gradually forced down to an even lower level than they have as yet reached. A demand on the part of the owners for the acceptance of reduced wages by the miners is therefore inevitable; and if, as appears most probable, the men mean to fight rather than go back finally to the rates current in (say) 1896, it is only a question of sooner or later before the trade of the country is further damaged and handicapped in its competition with its rivals by a stoppage of its coal supply. We shall be as surprised as we shall be delighted if counsels of wisdom prevail, and a conflict is avoided. We are always being told that labour leaders are now more enlightened than formerly. There will soon be an opportunity for testing the accuracy of the assertion.

This reaction in the industrial world, accompanied by the downfall of coal prices, cannot but be welcomed by the gas industry, much as those engaged in it would prefer to see a steady, regular expansion of business, instead of these periods of feverish activity followed by exhaustion and depression. It is as disorganizing to a nation as to an individual to make huge profits in some years and barely pay expenses in others. So long, though, as man remains a speculative and imitative creature, so long shall we have trade "booms" and Wall Street panics. The jubilations of one section of the gas world at the cheapening of coal are, however, to some extent marred by the imposition of the coal duty. We refer to the British-owned gas undertakings on the Continent, which draw their supplies of coal largely from this country, and who, working as they do under price-fixing concessions, are obliged to pay the duty out of profits. As will be seen from the joint protest addressed by the Imperial Continental Gas Association and the Continental Union and the European Gas Companies to Sir Michael Hicks Beach, which we print elsewhere, the duty represents a loss of about £28,000 per annum to those bodies. That is a serious matter for their shareholders, with whom we entirely sympathize; but it is impossible to legislate for individuals.

The South Metropolitan Bill in Committee.

THE South Metropolitan Company's Bill came on for consideration in Committee last week; and the evidence of the Chairman of the Company (Mr. George Livesey) was taken upon the financial provisions. The Company applied for additional capital powers to the extent of a million, in round figures; and they were opposed, as a matter of course, by the London County Council, who thought they ought to be satisfied with less. The figure named by the opposition was £800,000 in all; and subject to a little adjustment of the proportions of stock and loan capital, for convenience sake, this is probably about the amount of the accommodation that the Company will gain by their reappearance in Parliament this session. No man can say of the South Metropolitan Company that they are afraid to meet Parliament; but, after the present Bill, the Company should have rest for some years in this respect. There will be plenty for the Directors and Engineers to do, in working out the destiny

that has been laid out before them. Not only will the Company get as much money as they are likely to need for several years to come, but the matter of fresh stock issues will be settled in the manner proposed. So far, therefore, the promotion of this session's Bill has been quite successful.

With reference to the purchase of the Nine Elms property of the Gaslight and Coke Company, this is clearly a public matter, in which the part that the South Metropolitan Company offer to play is an affair of agency. There are obvious difficulties in the way of the settlement of this proposal on any imaginable lines that could be laid down in a South Metropolitan Bill. It is very well understood that uncompromising opposition will be placed in the way of such a "deal" between the two Gas Companies as should place the Gaslight and Coke Company in a more favourable condition than Parliament intended when this Company's own Bill was refused a second reading. On the other hand, the South Metropolitan Company have announced their willingness to have inserted in their Bill any reasonable and proper conditions with which the wisdom of Parliament may see fit to hedge round the execution of the recommendations of Sir James Rankin's Committee. Here arises the legal and constitutional question as to how far a Private Bill can be stretched to include the affairs of those who are not parties to it. But again it might be argued, perhaps, that the Gaslight and Coke Company are as much parties to this particular portion of the South Metropolitan scheme of legislation as any vendor of negotiable property is to the plans of an intending purchaser. It is a delicate question upon which we are not called to pronounce.

Yesterday afternoon, the Committee announced their decision, declaring the preamble of the Bill proved, subject to the proviso that the purchase of the Nine Elms property is not to take effect until the Gaslight and Coke Company shall have obtained further capital powers. Whenever this happens, the application of the purchase-money is to be settled; and every increased payment for gas by the Local Authorities north of the Thames is to go to the reduction of the charge for private lighting.

Progress of the Mond Gas Bill.

THE Mond Gas Bill was in Committee the whole of last week; the petitioners' cases being concluded on Friday. The Committee resumed yesterday at noon for the purpose of hearing Mr. Balfour Browne reply for the promoters. At the moment of writing, the result of the day's proceedings is not known; but should the Committee announce their decision on the preamble of the Bill before we go to press, a statement will be added to this article. It was narrated last week how the proceedings in regard to the Bill competed in interest with the transactions of the Institution of Gas Engineers, and, in particular, how engrossing they were for many of the Midland managers. It seemed like an example of the irony of fate, that exigencies of business in the Committee Room demanded the constant attendance of many representative gas engineers from Birmingham and the vicinity right up to Friday, when the opposition on the part of the Corporation of Birmingham was taken and concluded.

Mr. Charles Hunt was called upon to open the evidence on behalf of the Birmingham Corporation rather suddenly on Thursday, the 2nd inst.; and, as we have already recorded, he and his colleagues, Mr. Dugald Clerk and Mr. Corbet Woodall, took the first onslaught of the promoters' cross-examination. The Committee heard on Tuesday the case of the Corporation of Walsall, who simply desired to be excluded from the area of the Mond Company's operations on the ground that they did not want the proffered service, and that, lying on the extreme northern limit of the area in question, they might very conveniently be left out without any material detriment to the rest of the scheme. Several witnesses, local and technical, were examined on behalf of Walsall, and occupied the whole of the day. The evidence given in this part of the case considerably developed the opposition, and was replete with interest. On Wednesday, the opposition on behalf of the Associated Municipal Boroughs of Oldbury and Smethwick was opened by the calling of Mr. E. B. Ellington, who furnished a mass of weighty matter expository of the technicalities of power supply from central stations, and severely criticized the promoters' estimates.

Very interesting testimony with respect to the working of gas-engines with producer and town's gas was also given by Mr. C. W. Pinkney; and Lord Robert Cecil, K.C., made a powerful speech in support of the petitions of these Authorities. Mr. Ram, K.C., appeared for the Corporation of West Bromwich, and called Mr. Henry Davey, who, in his capacity of Consulting Engineer to the Corporation of Birmingham for their present water supply, and also to the South Staffordshire Mines Drainage Commissioners, was able to say a good deal about the suggestion offered by the promoters—that Mond gas, distributed in accordance with the scheme of the Bill, might prove useful to the latter body. Mr. Davey's evidence finished off Wednesday's work; and Mr. W. H. Y. Webber went into the chair the following morning to defend the cause of the established gas undertakings of the district. Mr. Ram, K.C., concluded the case for West Bromwich with a very able address; and the next evidence taken was that of Professor Vivian B. Lewes, who appeared for the Willenhall Gas Company. It would, however, be tedious to recapitulate the heads of the voluminous evidence given, and the numerous speeches delivered, in the course of this protracted inquiry.

To follow the investigation in every detail is as good as a course of technical education. One can but sympathize with the devoted Committee who have been called upon, in the course of their parliamentary duties, to preside over it. Their attention has never wavered; their assiduity has been beyond praise; and their patience has been equal to all the demands made upon it. Such an inquiry possesses the great advantage of starting at the very beginning. Though at the outset some time seems to be wasted over the exposition of the simplest and most elementary matters, such as technicians are accustomed to treat as granted, as day follows day the issues become clearer; and before the business is ended, there seems to be little to choose between the accomplishments of the various parties concerned. Whatever may be the result of the present hearing, there will at least be the satisfaction of knowing that the matter has been thoroughly elucidated; and more than this it is clearly impossible to say for the time being.

When the parties were called in yesterday afternoon, after the consultation of the Committee in private, the Chairman announced their decision. The Committee found the preamble of the Bill to be proved, subject to the conditions that—in addition to various points as promised by Counsel for the promoters—any new developments of the gas supply permitted by the Bill are to be certificated by the Board of Trade, and the shares of the Company to be allotted to Dr. Mond are to rank as follows: £40,000 to rank with the other share capital for dividend, and £35,000 to come in for dividend after the holders of the other shares have received 5 per cent. Thereupon the Counsel for the various petitioners announced their intention of reserving further opposition to the Bill for the Upper House.

The Affairs of the Imperial Continental Gas Association.

THE Imperial Continental Gas Association held their ordinary half-yearly meeting in London on Tuesday last—Mr. T. H. Goodwin Newton presiding. The Directors' report showed a state of continued prosperity over the whole of the vast area covered by the operations of the Association, that cannot but be satisfactory to the well-wishers of the gas industry at large. So far as the internal concerns of the Association are revealed by this statement, it must, of course, be said that the loss of the Vienna business has not yet been repaired by fresh connections; but, leaving Vienna out of consideration, the increase of gas consumption for the whole of the stations of the Association reaches the remarkable figure of 8·84 per cent. Consider for a brief moment what this rate of growth means. In the first place, it implies a general rising of the standard of comfortable living for the populations affected; and, secondly, it means that the Association are popular where they carry on their work. In a measure, Prague has been attached to make up for Vienna—another instance of the rivalry between Czech and German!

There was more than a touch of contemporary politics in Mr. Newton's speech to the proprietors, as the Chairman had to mention not only the incidence of an increased income-tax upon the Company's profits, but had also to refer to the exported coal duty. It is hardly necessary to say here that Mr. Newton spoke upon these matters as an English merchant should—that is to say, like a patriot and a gentleman. Not without an eye to business, either, for he has done his best to get a rebate on coal contracts made before the 18th of April. No more complete exposure of the emptiness of the British coalowners' complaint of the duty, as throwing trade into the hands of the foreigner, need be desired than that

which was given in Mr. Newton's speech. What drove the Association to buy German coal was the greediness of the British coalowner in doubling the price of his commodity. When gas coal rose from 8s. to 16s. per ton f.o.b., the Imperial Continental Gas Association would have been hard hit but for the happy chance that the Directors had made a good contract with a German syndicate of colliery proprietors. What is a duty of 1s. a ton to this extortionate "squeeze"? As for the duty itself, Mr. Newton confesses that it will cost the Association £10,000 a year. But there was no complaint. It was enough for him personally, the Chairman said, to know that the country wanted the money at a time of national emergency; and this spirit must have animated the rest of the company, for not a murmur was heard against the impost. "Ah!" but a pronounced Free Trader may say, "that is because the enhanced cost of coal, "due to the tax, will be paid by the foreign gas consumer." Certainly, in his degree; but was it not the intention of the Chancellor of the Exchequer, in putting on the tax, that the foreign consumer of British gas coal should pay it? Mr. Newton has the rights of it.

Dearer Gas for Manchester.

THE Manchester City Council have once more justified the "principle" of municipal trading by showing how easy it is for them to make a "profit" of £50,000 a year, or any other figure that they may fancy, out of the gas undertaking. It having been reported to the Council by the Gas Committee that the estimates of the department for the current financial year did not show a surplus "profit" of more than £11,000 available for relieving the rates, the Council promptly settled the business by ordering the Committee to make it £50,000, and be quick about it. Consequently, the Gas Committee have met and clapped another 3d. on the price of gas. This is something like "rising to the occasion." Of course, Manchester knows its own mind in these matters, and must be allowed to do its municipal business in its own way. Where is the gentleman who recently read a paper before a local statistical society glorifying the Corporation gas-works administration? Will he kindly oblige again? For, really, if this that Manchester has done is the acme and the mirror of municipal trading, there is no more to be said. As the French philosopher who had a difference with Napoleon I. observed, it is idle to argue with the master of twenty legions. So long as Manchester likes to have its "pound of flesh" out of the gas consumer, it will surely take it. That is the way of popular self-government. When it is bent upon a certain line of action, there is no checking or reasoning with it. Perhaps if the small householders and gas consumers of Manchester realized that they are to be called upon to pay 3d. more for their gas in order that their landlords may not feel the inconvenience of paying a higher rate than that which they have already compounded for, the members of the City Council who voted for the increase might be made to feel uncomfortable.

The cream of the joke can only be skimmed by a careful contrast of the gas and electricity supply accounts. After paying £10,000 or £12,000 a year in support of the rates for some time past, the Electricity Committee find themselves in face of an estimated deficit. They have given away the money they ought to have placed to reserve, until the sole contingency fund of a vast undertaking, with a capital outlay of nearly £900,000, is about £13,000. Now the ratepayers will have to go without their usual sop. A motion to order the Electricity Committee to adjust their estimates, so as to put them into the same box with their colleagues of the Gas Department, was strenuously resisted by the Chairman, and was lost. This is Manchester fairness as between gas and electricity supply!

The Question of Electrolysis: A Check.

THE subject of electrolysis was fought before a Committee of the House of Commons during the past week, upon the Bexley Tramways Bill; and the broad result was that the gas and water opponents failed to convince the Committee of the expediency of their being granted better protection than that afforded by the Board of Trade model clause. This decision is naturally hailed as a victory for the electric tramway interests. It is also regarded in certain quarters as a wholesome discipline for those electricians who have so far carried their independence of judgment as to take the side of the Gas and Water Companies against other members of the electrical household. This class of criticism, as we have already contended, is neither wise nor seemly. The opponents of the Bexley Tramways Bill upon this point were the South Metropolitan Gas Company and the Kent Water Company, who asked shortly that, irrespective of the Board of Trade regulations, any damage found to have been caused to their mains by electrolysis should be made good by the tramway owners—in this case, the Bexley Urban District Council. To this plea, it was objected that there is not, and has not been, any damage done by electrolysis where electric tramways are worked under the Board of Trade regulations. There have not as yet been many examples of such tramway working. In the absence of actual proof of electrolytic injury to pipes by the working of tramways, recourse was had on the present occasion to laboratory experiments and theoretical computations, which did not carry much weight with the Committee.

Sir Courtenay Boyle, the Permanent Secretary to the Board of Trade, gave evidence before the Committee, and willingly admitted the claims of Gas and Water Companies to the fullest protection for their pipes. He declared that the Companies are innocent users of the roads, and cannot protect themselves from the action of strayed electrical currents, of the very existence of which they cannot inform themselves by the methods ordinarily used in carrying on their business. He thought the Companies are therefore deserving of every consideration; but he could not admit that the Board of Trade regulations had so far failed to protect gas and water mains. This really settled it. The Committee decided that the preamble of the Bill was proved; and they offered no encouragement to the idea that the question of electrolysis might be raised on clauses. The matter cannot, of course, rest here. The gas and water interests think they ought to have the common-law protection for their property, and will ask the House of Lords to give it to them.

WATER AFFAIRS.

Conservation of Watershed Areas.

FOR the second time this session, the House of Commons has spoken with no uncertain sound on the subject of the conservation of watershed areas. Not many weeks ago it was asked to pronounce upon the merits of the scheme brought forward by the Wolverhampton Corporation to improve their water supply by drawing upon sources lying at some distance from the borough. It was shown to its satisfaction that the execution of the works contemplated would injuriously affect the landowners of the district, by depriving them of water; and the result was that the Bill was thrown out by a majority of 85. In noticing the event at the time, we remarked that it was an indication of the desire of the House to conserve sources of water to the use of the populations residing in their immediate vicinity. A further manifestation of this desire was witnessed last Thursday, in the discussion on the motion for reading a second time the Bill of the Rickmansworth and Uxbridge Valley Water Company. The Company sought power to extend their limits so as to include a number of places in Hertfordshire and Buckinghamshire; and, in order to be in a position to do so, they required to take more water from an area which helps to feed the Thames—which is, in fact, practically part of the river. The proposal naturally encountered opposition, not only from the Conservators, but also from the Councils of the counties immediately concerned, as well as from all of the Local Authorities in the district affected. The conditions were therefore in many respects similar to those obtaining in the case of Wolverhampton. Sir F. Dixon-Hartland, the Chairman of the Conservancy Board, condemned the proposal, on the ground that water would be taken from the Thames for the benefit of distant districts which had no right to it; while Major Grenfell characterized the scheme as one of "spoliation and robbery." No one could say anything on behalf of the measure but Mr. Boulnois, the Chairman of the West Middlesex Water Company, who urged that the points on which objections had been raised could be settled in Committee, after evidence had been heard thereon. This was not an unreasonable contention; but when the speaker alluded to the Bill, which had evoked such strong language from the member for Wycombe, as a "very harmless" one, his remark was received with derisive cries which indicated only too plainly the feeling of the House. Far from the Bill being harmless, Mr. Mellor, who followed, characterized it as so "vicious" that it should be denied a second reading; and as the right honourable gentleman was once Chairman of Committees,

and also a member of the Llandaff Commission, the House adopted his view without troubling to divide.

In the course of the debate, Mr. Buxton expressed the opinion that the time had come when demands such as that made by the Rickmansworth Company should be considered in connection with a comprehensive scheme for the conservation of watershed areas. Such a scheme has been prepared by a Committee of the County Councils Association, and it has been embodied in a draft Bill of which copies have been sent to the Local Authorities of the country for their suggestions. It provides for the constitution of representative Water Authorities for areas to be defined by Provisional Orders made by the Local Government Board on the application of one or more of the counties or the county boroughs interested, and for empowering them to put in force general enactments. Among the amendments of the law proposed by the Committee, and provided for in the Bill, are the prohibition of the appropriation of water within the area of a Water Authority, for sale outside such area, without the sanction of Parliament, and the placing upon companies or other bodies taking water for sale from the area of a Water Authority, the obligation to supply in bulk, at a reasonable price, to Local Authorities who may demand such supply. Thus a very definite step has been taken in the direction proposed some time ago by the British Association of Water-Works Engineers, and recommended by their Water Boards Committee, whose report was presented at the meeting of the Association towards the close of the past year. Co-operation between the two Associations should result in the production of some practicable scheme for submission to Parliament. The time seems opportune for the introduction of such a scheme; the feeling of the House of Commons, as displayed on the two occasions to which reference has been made, being apparently favourable to legislation upon the subject. The President of the Local Government Board has for some weeks had upon the paper of the House a notice for a Bill dealing with water supply; but no opportunity has yet been found for bringing it in and making its proposals known. Whatever they may be, those of the County Councils Association have been clearly laid down; and they appear not only to offer a solution of some of the difficulties which now exist, but also to be generally acceptable to the Local Authorities of the country.

Water Supply in Essex.

After two unsuccessful attempts to obtain parliamentary sanction for an extension of their works and limits of supply, the South Essex Water Company had the satisfaction last week of seeing the Bill promoted by them with the above objects in the present session almost through the Upper House. The circumstances which have brought the Company to Westminster three years in succession are somewhat peculiar. In 1899 the Directors recognized the need for a better water supply in the county; and they devised a scheme which would bring within their area some 24 new parishes, for the service of which a pumping-station was to be constructed at Mucking, and a reservoir at Laindon Hills. When authority to carry out this project was sought from Parliament, the Company were opposed by the Local Authorities, who expressed a desire to acquire their undertaking; and the result was that the Bill was rejected on a pledge being given that a purchase scheme should be brought forward in the following session. This was done; but the application was not restricted to the acquisition of the Company's undertaking. The scheme submitted to Parliament was for the constitution of a Water Board, consisting of representatives of several Urban and Rural District Councils, who were to carry out the purchase, construct additional works, and enlarge their area of supply; the capital applied for being about £1,250,000. Parliament refused to sanction the scheme, chiefly on financial grounds, but also because the Board proposed to go outside their area for their water, and, further, because it was thought that their pumping operations would detrimentally affect sources of water supply which ought to be conserved for the use of the districts in which they were located. Concurrently with this application, the Company renewed theirs of the previous session; but though, as it seemed to us, they made out a good case, the powers they sought were refused. Hence they were left in the position of being unable to adequately supply their district. This session, they have presented a scheme for which they are asking £100,000 less capital than that of last year would have required; and it has received the general approval of the Local Authorities concerned.

INSTITUTION OF GAS ENGINEERS.

PROCEEDINGS AT THE GENERAL MEETING,

HELD AT THE

INSTITUTION OF CIVIL ENGINEERS,

MAY 1ST AND 2ND, 1901.

Mr. W. R. Herring, M.Inst.C.E., of Edinburgh, President.

PAPERS READ

(*Continued from p.* 1221).

SOME DIFFERENCES BETWEEN BRITISH AND CONTINENTAL GAS ENGINEERING.

By C. E. Brackenbury.

When the President asked me to contribute a paper to the "Proceedings" of the Institution, and suggested as a subject the contrasting of English and Continental gas practice, I naturally felt some diffidence in complying with the request, as there must be many other members more qualified than I am to deal with it. However, having been privileged to manage a Continental gas-works, and being connected with a Continental gas undertaking, the subject was one in which I felt particular interest. Moreover, it was one to which attention has been frequently directed of late, by the remarks of our ex-President at the International Gas Congress; by visits abroad of deputations, engineers, and members of the Institution; and by the construction of entirely new works on the Continent—such as those at Zurich (to which reference will be made again), which have been fully described in the "Journal of Gas Lighting."

The term "Continental" is wide-embracing; and for the purposes of this paper, it may be well to limit somewhat its application. It is, of course, obvious that there may be many striking contrasts between Continental gas-works themselves—stretching over such an immense area as that included between the works at Trondhjem in the north and Malta in the south; between those at Samara in the east, and Lisbon in the west; with temperatures varying from below freezing point to considerably over 100° Fahr.; and with all the accompanying varieties of climate, people, habits, and wants. The word is, therefore, used in a very limited way, and in its popular sense—applying to those more or less well-beaten European countries of the Baedeker-armed tourist. Again, by "engineering," one includes not only the constructional considerations of gas-works, but also the practice and procedure of gas manufacture.

In making any comprehensive survey of the differences existing between British and Continental gas engineering, it is unavoidable that generalities should be considered, to which there will always be found many exceptions. But it is hoped that the danger of drawing general deductions, and of making general comparisons from isolated and insufficient data, will be avoided.

At the outset, one cannot help being struck by the fundamental difference between the training of the *personnel* of Continental and English gas-works. The former consists in part of men who have graduated in recognized public engineering schools, who, as likely as not, did not enter a gas-works gates until they had received their qualifying diploma, at an age when the British pupil is considered to have finished his course, and begins for the first time to find that he has yet everything to learn in his profession. The latter's earlier training, being more haphazard and less systematic, scientific, and thorough in the grounding of those subjects applicable to his career, though boasted of as being so practical, only leaves him at some disadvantage compared with the Continental student. Partly, no doubt, as a consequence of the better technical education received by the Continental engineer, his scientific status and social standing are far above those of his English colleague.

Even among the class of draughtsmen, it cannot be doubted by any who have been accustomed to examine drawings from each side of the Channel, that those from the other side show sounder training, wider accomplishments, and better effect. Needless to say, they are all drawn and dimensioned on the metric system. As an outcome of the

higher technical training of both chiefs and assistants, the modern gas-works abroad show a somewhat more studied understanding of the problems to be solved; a rather more careful calculation of ways and means; and a little more exact proportion in the plant. English works, nevertheless, still excel in directness of purpose, simplicity of apparatus, and thoroughness of workmanship. By grafting on to British methods, however, something of the spirit of the Continental engineer, will the future of the gas profession at home be made more secure and bright.

In one other direction are light and leading to be found over the water; and that is in the more artistic treatment of gas-works than is to be seen here. What has art to do with gas engineering, it may be asked? But the latter is only the mechanical expression of the former, without its imaginative appeal; and it is simply because Continental engineers, generally speaking, have a more innate æsthetic sense than we Englishmen, that they naturally produce more attractive works. It is surely better to build a retort-house both beautiful and practical, than one that is the latter only. The utility of an article is no excuse for its ugliness. Expense, fortunately, does not enter into the question at all; for a pleasing building need not cost any more than a plain one. And even if it did, something would have to be set apart for "moral and intellectual" considerations. It is thus that the fine *façade* of the retort-house, and other buildings of the new gas-works at Vienna, have achieved the distinction of being reproduced on the pictorial post-cards of that city's ornaments—not that this, however, in itself is any guarantee of artistic success. But can anyone imagine the same compliment being accorded to any English gas-works, with their grossly utilitarian and hideous houses? The author has, it is just to say, heard of one works in England, where the retort-houses were inspired by an exhibit in the South Kensington Museum, which have proved both useful and ornamental.

It has to be conceded, then, that Continental gas-works lead us in this matter of architecture and artistic taste. They further show it in the general arrangement of the buildings; in the colouring adopted; and in the neat finish of ironwork and apparatus. In many instances, of course, the works are so situated that great advantage can be taken of natural verdure, trees, and fertility of soil; and thus the relief of freshness and of variety is easily gained. Even, however, where there are not these natural advantages, the writer believes that a little cultivation both of taste and of soil, and some little effort in this direction in dull English works, would not be altogether wasted. But apart from this, there is certainly no excuse for the dirt and untidiness—not to say downright dilapidation—that are sometimes to be seen. Cleanliness and economy go hand in hand; and as we pride ourselves (erroneously in many cases) on the latter, let us look to the former, which is far more frequently met with in works abroad than at home. For our credit's sake, however, some well-built and well-kept British gas-works must not be overlooked.

It must be remembered that, although the previously mentioned characteristics are almost invariably found in Continental municipal gas-works, they are also not wanting in very many works owned by companies, whose property may lapse to the town authorities at the end of more or less limited and uncertain concessions. That they attend to these matters in face of the unstable conditions of their undertakings, as against the greater security and permanency in England, is much to their credit, and further shows the economic advantage of so doing.

There are other general comparisons that will suggest themselves, but which need not be dwelt upon. Among them are the lower cost of labour on the Continent, and the longer hours of work; the usual shifts being twelve hours, though the author knows of one agricultural district, where the stokers prefer to work even for twenty-four hours on alternate days. What a contrast to an eight-hour day!

Passing on to the consideration of particular items of comparison, there is perhaps not very much to be said as to the methods of receiving, storing, and handling coal and coke. Mechanical means of doing this are rather more general in England, with a decided tendency to become still more so, though one might say that the more perfect and complete installations (at least with regard to coal) are to be found on the Continent, where usually far larger stocks of both materials have to be provided for. In many instances, entirely automatic machinery, in conjunction with sloping coal-store flooring, has been introduced; and the interesting description of the Zurich arrangement will be fresh in mind.

Although English engineers may claim priority in the conveying of hot coke, yet the practical success of the De Brouwer chain must not pass unnoticed. There are signs, however, that even this is being greatly improved upon by English makers.

The extensive use of the Monier system of construction—as employed, for example, in the foundations and subways for conveyors, &c., of the Zurich works—may here be mentioned; and its successful adoption for some years past on the Continent may be noted.

Within the retort-house walls there are several points of difference between English and Continental practice. The regenerative furnace is more generally adopted abroad than it is as yet among us. Even in many very small works on the Continent, one finds the most modern of regenerative furnaces—no doubt in consequence of the dearness of fuel. The more usual system is that known as double recuperation; while in England simple recuperation is more popular. The former is certainly more economical in working; and undoubtedly more expensive in first cost. But the Continental engineer seems more ready to sink his capital in the best furnaces obtainable than his English colleague—prompted, as stated, by considerations of the value of fuel. Higher heats are also the rule, and slightly larger, or more frequent, charges are adopted; so that a much greater proportionate make of gas per ton of coal carbonized is reached than is customary with us. Outside producers, serving generally only one setting, but sometimes two, are on the whole more usual in Continental works; it being thought that the durability of the producers is thereby increased, their filling more easily accomplished, and their production of carbon monoxide more regular. Be these things as they may, there are some indications that inside producers are gaining in favour. The use of blocks in the building of retort-settings is more usual on the Continent than in England; and they are frequently made on the gas-works themselves from ground and re-ground old fire-clay material. Considerable economy is thus secured, and thoroughly satisfactory work results.

Continental settings are often single; and where they are back-to-back, the retorts are almost always ended ones, in striking contrast to English practice. Through retorts, with all their attendant advantages, even where originally placed, have, in the writer's experience, been done away with, chiefly owing to inability of the stokers to manage them, and because of the greater liability of ascension-pipes to become stopped up. Continental retorts naturally vary very much in shape, just as do English ones; but a typical example, arrived at after exhaustive trials and considerable expenditure by the Paris Gas Company, is of shallow ⏢ section, with curved bottom. It is 65 cm. wide, by 35 cm. deep, or about 25½ inches wide and 13¾ inches deep. Generally speaking, the characteristic features of Continental retorts may be described as being wider and shallower in cross section; their length being usually about 3 metres, or 10 feet. The writer has proved them to be as good "carbonizers" as can be found. Nine is a favourite number of retorts to set, in three horizontal rows, in a bed; though eight are frequently seen. Notwithstanding the higher heats, no serious drawback seems to have been experienced with the middle retorts, such as has apparently troubled English engineers, judging from the frequency of finding only seven, and sometimes even six, retorts in a setting.

The cross section of the typical Continental retort cited, has perhaps militated against the adoption of self-sealing lids; but these are now in process of becoming as general abroad as at home. Hydraulic mains are, one is inclined to think, rather more elaborately made and set on the Continent; a very usual form being known as "breech-loading"—that is, provided with a cleaning-out pocket along the whole length of the main. This is perhaps the result of carbonizing at higher heats, with its attendant troubles. A form of hydraulic main used, the writer believes, principally in Germany, is made with two or three internal division-plates placed longitudinally, so that the gas has to traverse the length of the main more than once on its way to the outlet. Also, the ascension-pipes are often of far greater length; and the bridge-pieces in some cases have cooling ribs cast on them. Mention may further just be made of the single self-sealing lid that is often adopted at the top of the ascension-pipes.

In comparing the 96,000 lineal feet of inclined retorts

already erected in this country (to be largely increased under the guidance of our President) with the 84,000 feet put up on the Continent, there is one important fact, apparently not generally known, to be borne in mind—namely, that practically the whole of the latter has been partly designed and entirely carried out by a single firm of contractors, owing to the fortunate or unfortunate influence, as the case may be, of patent laws and rights. It will be easily understood from this that, to a large extent, the individuality (if the term may be used) of the different installations under different engineers has become lost, or at least greatly diminished. In England, on the other hand, each engineer has been at liberty to work out his own salvation, or the reverse; and the consequence is the many divergent views, both as to general principles and particular details, with which we are all familiar. Some of the foreign patent rights, however, have recently expired, and others are about to; so that we may look forward to the various personalities of Continental gas engineers soon being given full expression for the first time, as regards inclined retorts. Under these circumstances, therefore, it is hardly fair, or of much value, to compare generally inclined retorts on the Continent with those in England; for, as stated, the examples of the former are not indigenous of the soil, so to speak. This opportunity may be taken, however, to refute a recent American assertion (one cannot but believe based on an imperfect acquaintance with the facts of the case) that "in Germany the development is highest, and a settled standard has seemingly been reached." And again: "Germany has made up its mind, both as to what it wants and how to build it, and is far in advance on the question." This last statement the author does not accept as a fact; and in the light of what has been said as to the monopolist aspect of the case, the "seeming standard" will be easily explained. In fact, that such a large number of installations of inclined retorts should have been put up on the Continent under the circumstances, is simply evidence of the great value of their principle; so that engineers said: "We had better put up such as we can get, than go without altogether."

Of course, the most striking difference between the Continental inclined retort installation and the English one is in the length of the retort. At Zurich, for instance, the retorts are only 3·50 metres, or less than 11 ft. 6 in. long; and in other cases, they are about 4·50 metres, or 15 feet long. They have never as yet been made on the Continent 20 feet long (the general English length); but the writer is aware of two Continental countries in which this length will, in all probability, be adopted for future installations. The reason for the shorter length of inclined retort on the Continent has been asked more than once; and the answer is partly to be found in the facts previously stated, combined probably with a fear as to the complete success of satisfactorily heating a 20-feet length, and a disinclination to depart from the original type of furnace and other details.

Other contrasts are the arrangement of nine retorts per bed, and the more usual outside producers and main flues. In some points, from the beginning, the Continental builders have been following a wiser course than English engineers. Among them is the span given to the arches, which has generally been, for a bed of nines, 3 metres, or nearly 10 feet, compared with the English figure (up till recently) of 9 feet or less. The writer has recently designed a bench, with a span of arch 3·25 metres, or 10 ft. 8 in., which he believes to be the maximum yet adopted. The strength of piers has also always been greater in Continental installations; being 75 centimetres, or nearly 2 ft. 6 in., against the weaker English thickness of 1 ft. 6 in. Abroad it is also very usual to leave a clear space above the fire-brick arch for free expansion; and there are other smaller details of comparison.

But it is in the system of charging the retorts that a really fundamental difference of principle occurs. Here in England we have, generally, overhead hoppers for the whole length of the bench, as is indeed necessitated by the usual arrangement of a fixed measuring-chamber, containing the charge of coal, over each vertical tier of retorts. The operator in this case has merely to pull a lever to charge the retort. But on the Continent the storage tanks are not often continuous; and the charge is suspended in a moveable kind of coal-scuttle shoot, so that there is the additional labour of running it to-and-fro, loaded and unloaded. In the former arrangement, as usually adopted, the operator is compelled to put into the retort the whole of the measured charge; whereas in the latter he can put in as much or as little as he chooses. What are the advantages of the two systems as labour-saving appliances, and which principle—compulsion or freedom—is the correct and practical one to apply to gas-works stokers? Without marshalling the arguments *pro* and *con*, which hardly come within the scope of this paper, the writer's opinion, from knowledge of both systems, is that the English practice of compulsion (continuous hoppers, measuring-chambers, sure-feeds, and single levers) is the only sound and secure one.

While not admitting that the Continental installations of inclined retorts, erected under the conditions described, are equal on the whole to those erected by many English engineers, yet the author wishes to pay a tribute to the many admirable features of the German (for they are all German designs), and the thoroughness and excellence of their execution—particularly as regards the quality of materials used, and the construction of the furnace.

British makers hold practically a world-wide monopoly in machinery for charging and drawing horizontal retorts; and every meed of praise should be accorded to its inventors for the admirable and satisfactory results of their labours and ingenuity—thus in one department at least keeping a strong lead over all comers. There is still much to be done on the Continent in the introduction of stoking machinery; and the author was glad to be connected with the first installation in one country, which has recently adopted a second plant. It is to be hoped that this economical means of carbonizing will soon be further extended in Continental gas-works, where the existing settings are suitable.

Leaving now the carbonizing department, and turning to the accessory apparatus, we find the general sequence of manufacture to be approximately the same. There are particular items to notice, however, that will be dealt with in due order. Modern Continental practice undoubtedly is to adopt large atmospheric cooling (as they are better named than "foul") mains, before the exhauster, and to use water-cooled condensers preferably after. Again, the whole tendency to-day on the Continent is to abolish high apparatus in favour of that equally efficient but low—to do away with vertical condensers and tower scrubbers, and to adopt horizontal ones and mechanical washers. This is, of course, the result of greater extremes of temperature than are known in England, and the consequent necessity of protecting all such plant from the effects of weather.

The contrast to be noted in the exhausting plant is chiefly the more general Continental use of Anderson exhausters; and where Beale's are to be found, they are generally of the old two-blade type. A few of the latest Donkin patterns have been introduced; but some preference still seems to be given to reciprocating machines, on the score of durability and facility of repair.

After the exhauster is placed almost invariably a friction-condenser or tar-extractor, of a form hardly ever seen in this country—popularly known as the "Pelouze," from the name of one of its inventors, MM. Pelouze and Audouin. It is often placed in the exhauster-room itself, as to be of maximum efficiency it requires a certain amount of warmth. It is a most satisfactory and clean apparatus, occupying but small space, and effectively removing all traces of tar from the gas.

Water condensers are preferred abroad to atmospheric ones, on account of the greater control they afford over the temperature of the gas, and as the coolest of water can generally be obtained in the hottest of summers. Mention may also be made of another type of condenser of Continental origin, sometimes called a condenser-scrubber, from the fact that the outside of the water-tubes is sprinkled with ammoniacal liquor. Such condensers on the Reutter system have been put up at the Zurich new works.

As already stated, washer-scrubbers are held in great favour on the Continent, among other reasons, because they can be so easily roofed over, and owing to the ease with which they can be regulated to the work to be done, and the small amount of low-pressure pumping required. The makers abroad turn out a really first-class machine in every respect, with several small mechanical improvements in details.

Although steam is, of course, used for motive power, the extensive adoption of electricity in many works, as an auxiliary, for a variety of purposes, must be noticed. There does not appear to be on the Continent the objection to its presence within the precincts of a gas-works that there seems to be in England. For lighting, it is especially applicable to gas-works; as is evidenced by there being nearly

four times as many electric lamps as gas-burners at the Zurich works. For driving isolated motors, it is obviously convenient, as shown by many instances—such as, for example, the portable elevator for coke seen at the Clichy works. There are gas-works, nevertheless, in England, where electricity is produced side by side with gas, and yet where no effort is made that the one may assist the other.

There does not seem to be any striking contrast in boiler practice, except perhaps that, owing to the greater value of fuel abroad, a cheaper kind—such as coke-breeze, &c.—with forced draught, has long been more generally used.

The most noticeable feature in connection with purifying plant is the absence on the Continent of boxes of any great area. Small purifiers are preferred even in large works, on the assumption that there is greater ease in manipulating the material, though the drawbacks of this method of working, both chemical and mechanical, are now better understood. The author has recently been connected with the designing of eight 35 feet square boxes, dry-sealed, with india-rubber luting, which—both as regards size and system—are something of a novelty abroad. They are placed on a stage-flooring, and filled with lime and oxide by means of jib-cranes for the former, and elevators, conveyors, and shoots for the latter. A somewhat favourite Continental system of handling purifying material is that adopted at Zurich, consisting of a single line of overhead rail with tip buckets.

Of course, the conditions abroad with reference to the extent of purification required are not nearly so onerous and exacting as generally at home. The most customary stipulation is that the sulphuretted hydrogen shall be completely taken out of the gas; but the removal of the other sulphur compounds and carbonic acid is not insisted upon. As a consequence, oxide of iron is the material most largely used—in many cases exclusively. It is generally employed in the form of Laming material, and is often made locally on the gas-works.

The smallness of size and largeness of number of the purifiers are no doubt partly responsible for the extensive adoption of ordinary dry inlet and outlet valves. The old hydraulic centre-valves are sometimes used; and an admirable dry centre-valve of Continental origin, but of English modification (the "Weck") may be mentioned.

The casings of Continental station-meters are almost invariably of cylindrical form; and it is somewhat curious that large English works should almost equally invariably adopt the rectangular type, often expending upon it a considerable amount of ornamentation. The modern Continental practice of replacing the usual meter-dials by "jumping" figures, recording the actual amount of gas passed, may just be noted.

With gasholders as with purifiers, the average smallness of size adopted on the Continent is remarkable; it being only within a comparatively recent period that three-lift holders have been erected to any extent. A detail of construction in making the side sheets break joint is very old, and incidentally may be observed. Gasholders within houses are sometimes met with, and are generally due to local and climatic considerations. In this department of gas engineering (which offers considerable scope for constructional ability on the part of the engineer), English makers of gasholders have led and taught the world. But there is no disguising the fact that in this, as in other branches of manufacture and commerce, their supremacy is seriously threatened. Continental competitors are springing up, are profiting by our experience, are improving upon our ideas, are surpassing our workmanship, and are adapting themselves to local requirements. English manufacturers of gasholders and gas plant should, therefore, be on the alert; and by adopting every possible improvement, they can combat the competition, and overcome the severe handicap of transport and customs duties.

Station governors abroad are not so generally of such finish, accuracy, and sensitiveness as those at home; and there seem to be lacking the many automatic refinements that are often found in English ones.

From what has been said on purification, it will be understood that the illuminating power of Continental gas is generally speaking much lower than that sent out from British works. For this reason, among others, there is not therefore that necessity abroad for the adoption of carburetted water-gas plant and other enriching apparatus, as there is in England. Besides this, in some countries, petroleum oil is a Government monopoly; and its import duty doubles or trebles its original cost, and places it out of comparison with cannel and boghead enrichment. There are, however, localities where such drawbacks do not exist, and where plant is in successful operation. The increasing adoption, in suitable cases, of benzol for enriching purposes, and apparatus for the prevention of naphthalene deposits, may be alluded to.

Having reviewed some of the points of contrast offered between the manufacturing plant of coal gas in British and Continental works, reference may now very briefly be made to comparisons in the treatment of residuals, labour, and lighting.

A greater number of small works is to be found abroad than at home, in which the manufacture of sulphate of ammonia, or some concentration of ammonia, has for many years been carried on. Then, again, the recovery of cyanogen from the oxide of iron used in the purifiers, has been largely practised for a considerable time past, and also its direct absorption from the gas has been, perhaps, of earlier date, and of greater extent. Further, in many gas-works the manufacture of briquettes has been found advisable; and, generally, the writer thinks it may be stated that more attention has been paid in some particulars to bye-products on the Continent than in England. In this connection, one may say that properly fitted and properly used laboratories are not quite so rare in Continental works as they (unfortunately) are in British.

Now with regard to the treatment of labour. It is more than usually difficult to generalize with any degree of accuracy on this question. There are Continental gas-works where the employees are unduly pampered, and their moral stamina thereby weakened; and, on the other hand, works may be found where the stokers and labourers are not treated in a proper spirit of fairness and consideration. Between these two extremes one is glad to note that, in the large majority of cases, a sound balance is kept between the one and the other. In those countries where the emancipation of the working classes is but half, or but recently, accomplished, there is naturally a tendency for them to err in the way of extravagant ideas and demands, and to lose temporarily their sense of proportion. And though some may rightly fear the growing evidence abroad of the power of labour to capture municipal seats, and the possibility of the abuse of its position and privileges, yet the author, while safeguarding all interests by the adoption of the most economical and mechanical means of manufacture, believes in the eventual recognition of mutual rights, and the peaceful blending of apparently conflicting interests. Baths, lavatories, mess-rooms, and (at Zurich) "first-aid" room, restaurant, and workmen's dwellings—though they have apparently forgotten the important educational effect of a technical works library—these are the outward signs of the modern progressive spirit. The higher wages of English gas workers are more wastefully and more foolishly spent than the lower pay of their Continental fellows, and withal they lack that innate sense of courtesy, politeness, and even cleanliness that is so generally remarked abroad.

In the department of piping, mention may be made of the old use of Chameroy pipes, still often found in many Continental towns, and of the present extensive adoption in some countries of the Lavril pipe and india-rubber joint. Where there is a straight long length of main to be laid, the convenience, cheapness, and speed of the latter system would seem to offer certain advantages over the far more usual method of lead jointing. In some towns, subways under both foot pavements have been insisted upon for gas and other mains.

The much-discussed question of street lamp-posts, lanterns, and illumination in England leaves but little further to be said. The deplorable neglect, the hideous unsightliness, the unsuitable pattern, and the utter inadequacy of the whole, have been emphasized again and again. Care might at least be taken, all the same, to offend the eye as little as possible, by seeing that the ugly things be placed perpendicularly, and that the dirty lanterns be fixed squarely and truly, as is so rarely the case—in North London at all events. Some well-considered steps have been taken toward improvement in South London, and in a few other instances—one being a small cathedral town in the West of England, where the writer, on some holiday ramblings, was agreeably surprised by graceful lamp-posts and incandescent brilliancy. We are, however, sadly behind the times and the Continent in this respect, as our Past-President (Mr. Marshall) once took the trouble to show us in a very pleasing and practical way. Abuse of the present state of public darkness has been

general enough ; and the author cannot help thinking that if something in the shape of actual organized improvement were simultaneously put forward by the gas companies and corporations represented in the Institution—particularly with the aid of high-pressure burners—some upward public movement might result.

Incandescent lighting on the Continent, as is well known, is far more general than at home, encouraged abroad by the greater cheapness of the burners and mantles, and in part, also, by the gas being usually both dearer and of lower illuminating power. As there is evidence that we are following in the sensible direction of replacing candles by calories, it may be hoped that in the future, by energetic endeavour, this leeway may be made up.

The Continental trade in consumers' meters was originally built up by English firms, descendants of which may still be found scattered about Europe. The meters abroad are usually wet—in some countries these being the only ones permissible, though a commencement has been made to adopt dry ones, as more generally used in England. Prepayment meters were far later in being introduced on the Continent, and are still suffering from initiatory difficulties.

Gas-stoves for cooking are widely used abroad, though for heating, coke, charcoal, and wood, burned in suitable slow-combustion stoves, are the fuel in favour ; coal being rightly undreamt of in this respect. The high price of gas, as well as the large consumption required, wedded to inartistic designs, tend to prevent the extension abroad of gas-stoves, just as they militate against their adoption at home—thus retarding the day of clean cities. Gas-engines are extending pretty generally everywhere.

To sum up the more striking of the broad differences between British and Continental gas engineering, what do we find ? Generally in Continental works, a more pleasant and tidy appearance, and greater architectural and artistic effect ; a firmer basis on scientific principles ; and a more careful calculation of requirements, with a staff more thoroughly equipped in technical and mathematical data. British works convey the impression of being mean, and often unnecessarily ugly and dirty. They impress one as having gradually grown from a primordial practical germ, while Continental works strike one as having evolved from a later tissue of engineering calculi. Abroad, freer scope is given to chemists and experimenters ; and their scientifically prosecuted investigations lead to better results in the higher branches of research than can be shown by inquirers at home. Continental works are the more sensitive to answer to the calls of modern necessities ; while British works plod ponderously along in their old conservative methods. British gas-works have, however, the enormous advantage of the finest raw material, both in men and in matter, to be found in the world. The former only require a little proper guidance, suitable technical instruction, and some small encouragement. The latter needs but scientific investigation and mechanical manipulation. Our works are the offspring of the practical genius of the eminent pioneers of the gas industry ; and they are stamped with their original earnestness, fitness, thoroughness, courage, and character, and as such they are unapproached by any the world over. But as the signs of the times show that there is a national awakening to the fact that our general industrial life is threatened, and as there is an evident desire to examine into the weak points of our machinery and to improve it, so may it be said of the British gas industry—attacked likewise by many competitors—that it is determined to bestir itself, to throw off the lethargy of monopoly, and to profit by every means in its power so as best to utilize its raw material, to cheapen its commodity, and to take its proper place in the foremost rank of the benefits conferred upon mankind by British engineering.

Discussion.

The PRESIDENT said this was a most admirable paper ; and though there were parts which did not sound altogether pleasing, they must admit there was some truth in them, and that they were well worth attention and consideration. Having had the opportunity of visiting many Continental gas-works, he could fully endorse a great deal of what the author said. No doubt a large number of English works were far more hideous than they need be ; but in some situations any ornamentation would be thrown away. For instance, it would be no use to make artistic gas-works in Sheffield. But there were many towns where gas-works were so situated that they need not disfigure the neighbourhood. A few trees, a little grass, and some attention paid to the architectural effects, would go a long way to make them more pleasant neighbours to those who seem so fond of crowding round them. Another important point referred to was the amount of skilled supervision of the various departments and processes which was found to exist in Continental gas-works. Perhaps in England there were not at present a sufficient number of competent men to undertake departmental supervision to such an extent as on the Continent. The necessity had not hitherto been recognized ; and consequently the men were not in existence to fill the places. They had only to determine to carry out such a practice, and competent men would soon be found to fill the situations. He certainly thought that it would be well if each of the principal departments in the manufacturing processes—such, for instance, as purification—was under the supervision of one man, who should be held responsible for the result, both as regarded efficiency and economy of labour and materials.

Mr. J. D. ASHWORTH (Portsmouth) congratulated the author on his excellent paper. He certainly agreed with him as to the importance of skilled training. There was no doubt they should bring up their assistants in a more scientific way, so that they could go into all the details of manufacture. He did not agree with the author as to the artistic treatment of gas-works ; and he did not think English companies would ever put up elaborate buildings such as they saw represented in the "JOURNAL" as being erected at Vienna. To him it simply appeared an amount of capital thrown away which was completely unnecessary. Their object was to keep the capital account as low as possible. They wanted substantial buildings, with a little good taste, but nothing superfluous. As to the colour adopted, he did not see that this was of much importance, because, in the majority of gas-works, the colour would soon disappear, owing to the dirty nature of the business. With reference to economy and cleanliness going hand-in-hand, he quite appreciated the author's statement. Far more work was got through if the place was kept in good order and clean ; and the men worked with more ease and comfort. With regard to the hours of labour, he was not an advocate for anything over an eight-hour shift for retort-house work. It was hard work, and eight hours at a time was sufficient. With regard to coke conveying, in the new works he was about to erect he did intend to put up coke conveyors ; but it would only be to carry the coke out of the retort-house in one direct line. As soon as it was delivered, he should not turn it at right angles in any direction, because this meant complication, and crushing the coke into small pieces, and so considerably reducing its value. There might be some advantage in higher heats ; but there were many disadvantages, such as stopped pipes. He agreed with having the producer outside the retort-house. Some years ago, at one of the Manchester works, they had eight beds of settings with outside producers under the stage-floor ; and the heat was so tremendous that the men could not work satisfactorily, so that they had to be altered. He did not agree with the use of blocks for retort-settings. The less special material they had, the better ; and it would be very difficult to get two blocks alike. There would be a great deal of twist in them ; and when they came to be set, there would be extra cost for cutting. There was nothing equal to ordinary bricks and square tiles. Of course, he agreed with grinding up the old fire-clay. There might be something in the Continental plan of having the settings back-to-back where stoking machinery was installed, for the simple reason that it was not always possible for the machines to work together, and for the retorts to be charged at the same time. The consequence was the stokers on one side of the bench would often close the doors before the men on the other side, and then gas was lost. If they had a single retort, it did not matter very much if one man was a minute or two later than the other. With regard to the hydraulic main, he agreed there should be a space at the top, so that the expansion of the retort-bench should not have any influence in raising the hydraulic main, tilting it out of level, or throwing any undue seal on the dip-pipes. In regard to the arrangement inside the main, which meant the gas taking a serpentine course with the tar, he could not see the use of this. He remembered on one occasion, if they had had such an arrangement, there would have been considerable difficulty when, instead of the tar running away in the ordinary manner, they had practically distilled tar in the hydraulic main, and the pitch inside it had to be pulled out with blocks and falls. The width of the benches would, of course, depend upon the size of the retorts used. As to the

proposed 10 feet for the width of the arch, this would depend upon the size of the retorts. He would not have 10 feet space for 24-inch or 22-inch retorts. He was an advocate of 6 inches clear space between retort and retort, and also between the outer retort and the wall, so as to allow for any accumulation of clinker. In regard to the exhausters, he thought that the Anderson was the best; there was not the same wear and tear on the cylinder when the piston worked vertically. In a horizontal exhauster, there was a greater amount of wear on the lower side, and the cylinder had to be bored out much oftener. He entirely agreed with the author as to washer-scrubbers. Where they had a high temperature in the summer time, the sun influenced the action of the scrubber, and affected its efficiency in taking out the ammonia. With regard to the use of electricity in gas-works, it seemed to him like taking the bread out of their own mouths. He should never advocate that.

Mr. James L. Chapman (Harrow) said they were much indebted to Mr. Brackenbury for his paper; and he was very glad he had pitched into English gas-works in the matter of their appearance, for they made about the ugliest things they could put together, and at the greatest expense. There was no real reason why things should not be made brighter than they were; and he believed a good engineer would carry out the work in a manner at the same time pleasing to the eye and useful. The President had great knowledge of the system of inclined retorts; and he should like to ask him, as he had his plans all ready, his views about using continuous hoppers. An engineer who had recently put up inclined retorts, told him that he found non-continuous hoppers a mistake. He had designed a continuous hopper; but he found the expense much more than with a non-continuous hopper, on account of the height of the house and for several other reasons. But he understood that some considered the whole cost would be saved in the wages of the men.

Mr. E. A. Harman (Huddersfield) said they were indebted to the author and others for a considerable amount of advice respecting the training of young men; and it seemed to him that they ought to have a department in the nature of a nurses' institution. The question of artistic merit was simply one of cost. They had seen on the Continent instances of fabulous waste; and pictures had been presented to former meetings of the Institution of works set out in the region of a park, where everything that could possibly be added to make the place beautiful had been introduced. But they could not—nor was it desirable if they could—undertake such expenditure as that in England. It was all very well to talk about moral and intellectual considerations; but these could not be worked out at per ton of coal carbonized. In regard to the stokers' stint and times of duty, the names of none of the works were mentioned; but it was said that at one of them the stokers preferred to work 24 hours on one day, so as to be at liberty, he presumed, to pursue their agricultural pursuits the next. He thought that this must be a joke. They could all understand that, if a stoker worked for 24 hours one day, he would want to spend 24 hours in bed the next, so as to be ready for the following day's work; but he did not see anything to be gained by this. It was said to be the Continental practice to have settings of nines. At Huddersfield, they had nothing but nines, which worked admirably. The electric light was eminently desirable if one had a dynamo and power available; but it was all a question of cost, not of bigotry or narrowness, as suggested. If, however, there was a gas-main close to where a light was required, it was the simplest possible thing in the world to put on a small meter and utilize such a supply. The average quantity of gas consumed in British works was about 1 per cent. of the make; and he did not think any gas engineer had the slightest objection to electric light being used where it could be economically employed. Reference was made in the paper to the Weck dry centre-valve, which was said to be of Continental origin. Mr. Weck was a personal friend of his. He was a nephew of the late Mr. Charles C. Walker (of Messrs. C. & W. Walker), and, though a German by birth, was a naturalized Englishman brought up in England, and educated in London and Shropshire. Indeed, his whole training was in England; and his valve was designed and drawn out in the drawing-office at Donnington. It was afterwards adopted, he believed, all over the Continent and the United Kingdom, and was undoubtedly one of the best centre-valves in existence. With regard to the incandescent light, the sole objection to it in England had been the methods adopted by the Welsbach Company, whose ways at first were most arbitrary; and these constituted the chief hindrance to its extension. Purchasers for some years were required to sign an agreement under which they were subject to all sorts of pains and penalties if they used the mantle on any other burner, and all sorts of ridiculous and absurd restrictions. These things were being rapidly overcome; and, with the expiry of the patents, undoubtedly incandescent lighting would be adopted in the United Kingdom as extensively as it had been on the Continent, where like difficulties and obstructions had not been experienced. Then the author said: "Continental works are the more sensitive to answer to the calls of modern necessities; while British works plod ponderously along in their old conservative methods." No proof of this was adduced. It was all very well to make the statement; but he could not say he agreed with it. He had been in many Continental gas-works, and had seen things there which he could certainly have criticized pretty freely. But when they went on the Continent they did not look for defects, but rather for what they could copy with advantage, and they were naturally disposed to put the best construction upon all designs, and give credit for special local considerations. The author stated, too, that prepayment meters were far later in being introduced on the Continent than at home, so this did not look as if they were so "sensitive to answer to the calls of modern necessities" as might be supposed. Millions of these meters were now being used in the United Kingdom, but Continental works had done simply nothing in the matter. He made these remarks in no captious spirit, because he thought they were much obliged to Mr. Brackenbury for his attempt to show the differences existing between British and Continental gas engineering.

Mr. Richard Brown (Cambridge) said he had not visited many Continental works; but he thought Mr. Brackenbury had gone out of his way in making some of the comparisons he had. Ornamentation, for instance, was all very well in its way; but when they came to spend so much money on making the place look pretty, the question was where were the dividends to come from. He thought capital should be spent in providing proper works and plant, not in making the place look like an international exhibition. Mr. Chapman had referred to continuous hoppers. He had not the slightest doubt, after some three years' experience with continuous hoppers, that they were much preferable to the others. The author had referred to the British working man, whom he accused of want of courtesy, politeness, and cleanliness. This might be right to a certain extent, and they all knew that the British working man was not an angel, either in his language or his actions; but he thought that such remarks were as well omitted.

Mr. William King (Liverpool) agreed with some of the previous speakers with regard to the ornamentation of gas-works. Many Continental works he had seen were magnificent; but the buildings were not necessarily more suitable for gas making than plainer erections. The question with themselves, as constructive engineers, acting for companies and corporations, was how to produce a sound, substantial building at the lowest possible cost. They had not only to look at the general effect, but to consider the result of the wear and tear of time on the building, and also the unavoidable smoke and dirt which proceeded from a retort-house, however well conducted. It had been his object, in the works constructed at Liverpool, to reduce the buildings to the simplest possible form, doing away with all unnecessary ornamentation—especially with projections, which were often only a source of decay, and formed receptacles for dirt. A plain, substantial building could be produced which should not have an altogether unpleasant effect, and which should not present those weaknesses for the ravages of time. Money might be wasted in encaustic tiles and polished mahogany, which were not essential, and which were not engineering at all. The first thing to aim at was thorough efficiency. At the same time, he entirely agreed that gas-works need not be the untidy, dirty places they sometimes were. It was not necessary to have tar running about the place, or for the yard to look as if it were never swept or looked after. The works might be kept perfectly clean and orderly without very much expense. Many works in the outskirts of towns might be made to look pleasing by a small expenditure in putting down a little grass and a few shrubs. All these things might be done without extravagance. He thought they might say, with a good deal of national pride, that their apparatus, and the essential parts for the manufacture of gas, would compare very favourably with the practice on the Continent. At the same time, he thought they must fully appreciate the

great kindness always shown by their Continental friends in whatever country they had visited. He quite agreed that they went there with a view to seeing the result of that scientific training which so many of the gas engineers on the Continent had enjoyed, and to benefit themselves by the adoption of any new ideas which it seemed at all desirable to introduce.

Mr. A. F. Browne (Vauxhall) said he thought the use of outside producers was a step in the right direction. The late Mr. Frank Livesey was the first at the South Metropolitan Company to make an experiment in this direction; and he believed that Mr. Carpenter was still pursuing it. It seemed to him the outside producer had much to recommend it. It simplified the work of the retort-house, and removed a possible source of danger to the men. It also contributed to the length of life of the producer, inasmuch as it facilitated its being charged at any moment, when necessary. It was largely owing to producers becoming short of coke that damage was done to them; and their life might be almost indefinitely lengthened if they were kept constantly full. He should have been glad if the author could have told them that their Continental brethren had made the further step of providing a holder for their producer gas to be stored in; but he hoped this would come some day—that some gentleman building a great works in some part of the British Isles would see his way to make an experiment of this kind. Then they would be in the position that they would have a gas of known quality, and would be able to supply a known volume to the combustion-chamber and to add the requisite amount of air for combustion, when, for the first time in the history of the gas industry, they would have their heats under proper control. They were told that on the Continent the hydraulic mains were laid in a form known as breech-loading—that was, provided with a cleaning-out pocket along the whole length of the main. This told a tale. They all knew what it meant. It appeared that abroad they met with the same difficulties as were encountered in England—that at certain points the gas dissociated, free carbon was deposited, and pitched mains followed. This was a difficulty which they all experienced; but it might be got over. A constant flush of hot liquor would have a very good effect; and some reduction in the area of the main would be found useful. The position of the main with regard to its height above the brickwork should also be attended to. Then it was said that the ascension-pipes were often of far greater length, and the bridge-pipes in some cases had cooling-pieces cast on them. He had not seen this in British gas-works; and it seemed a new idea to make the ascension-pipes deliberately part of the condensing apparatus. So far as he was aware, the British practice had been to make the ascension-pipes as short as possible. Further on, there was an interesting statement with regard to Continental practice in condensation; and he ventured to say it was in condensation that they had most to learn. He thought condensers were the part of the apparatus about which they knew least. If any gentleman had not calculated out in figures the number of British thermal units required to be removed from a known volume of gas at a certain temperature to bring it down to the temperature of the atmosphere, when he proceeded to do so, the result would astonish him. The rules laid down in treatises with regard to condensation were, he feared, mere rule-of-thumb. They required to know exactly what heat they had to remove; and then they might hope to devise suitable apparatus to remove it. He was inclined to agree that the Continental people were right in having a preference for water-condensers. They certainly afforded readier means of bringing about the desired result in a smaller space. Probably, they were all familiar with the steps that had been taken in the direction of putting condensers in covered buildings. At certain times of the year, this was of great use; but he was inclined to think that the day might come when, not only for keeping the condensers under control, but for the sake, in the summer, of bringing the temperature down as low as possible (for, from the point of view of the naphthalene nuisance, the gas, after it left the works, should never be colder than it had been at the works), some enterprising engineer would put his condensers in subways, and employ a fan in connection with a waterspray. He was disposed to agree that electric light was not the best advertisement for exhibition in gas-works.

Mr. G. S. Sayner (Harrogate) thought the question of the greater regard to appearances in Continental gas-works had very much to do with climate. He should like to know if the method of tar-extraction referred to had been adopted anywhere; and, if so, with what result?

Mr. H. Hawkins (Todmorden) said he had had some considerable experience of inclined retorts; and three years ago he mentioned the advisability of taking the gas off at both ends—top and bottom. He devised a scheme for doing this with one of the beds, and found very great advantage. By taking the earlier gas out of the top end, they obtained from 400 to 500 cubic feet more per ton of coal than from the other beds. The coal was so regulated as to have a continuous charge for the inclined retorts; and sometimes it went down rather rapidly, and the bottom end was liable to be choked up. When the charge had been in something like half-an-hour, this coal would rise to the top and completely block the gas from the ascension-pipe. Taking the earlier gas out of the top end was a step in the right direction; and they were going shortly to alter the remaining beds and put them on the same principle. They had no difficulty whatever from overheating of the ascension-pipes, and found no stopped ascension-pipes or bridge-pipes. He would also mention that he had the latest and best method of charging apparatus; but still the coal would creep, and it was quite impossible to prevent it. He therefore contended that, by the double outlets, they had nothing to lose, but all to gain. He should say that at Todmorden they used slack coal only. Why should they have mouthpieces and ascension-pipes at each end of through retorts, if they were not required?

The President said, before calling on Mr. Brackenbury to reply, he would briefly answer the question Mr. Chapman had put to him as to the coal-hoppers for inclined retorts. His principle with regard to the system was this: They must, in the first instance, mechanically handle the coal, in order to get it to the required elevation for charging the retorts by gravity. As this was a necessity, it was as easy to deposit the coal in exactly the position required for charging the individual retorts, by distributing it in a long continuous hopper running the entire length of the bench, as to deposit it in a large hopper localized, but not necessarily covering the whole of the bench. The latter necessitated the employment of additional labour to transfer the coal from the storage hopper to the particular retorts to be charged. There was also some considerable loss of time with elaborate charging arrangements, as the charger had to carry the charge a certain distance in the retort-house; whereas in the former case the coal was immediately above the retort to be charged, and the charger had simply to direct the current into the retort. He did not think the additional cost of the continuous hopper system was so great as Mr. Chapman thought, if the design and construction was of the ordinary type. The same weight of coal must be stored in either system; and the greater the bulk stored over a given area, the greater strength was required in the construction of the hopper. Continuous hoppers need not be more than $\frac{3}{16}$ inch thick, properly stayed, extending continuously for the length of the retort-bench, with the measuring-chambers supported beneath them. He thought that this was the best system, and certainly the most economical and expeditious as regards labour. Mr. Hawkins seemed to be suffering from trouble with his charging arrangements—a trouble that was experienced by many, but which was easily avoidable. He did not admit the necessity of putting up two ascension-pipes to overcome defective charging; he preferred to employ effective charging arrangements and proper means to regulate the charging of the coal into the retorts.

Mr. S. Simmelkjör (London) said the previous speakers seemed to have taken for granted that what the author said was correct; but it was his unpleasant duty to have to criticize some of those statements. He had not the least doubt there was very great difficulty in comparing Continental and English gas-works, for the simple reason that there was not such a thing as a typical English gas-works or a typical Continental one. One had to inspect a certain number of gas-works in both countries, and draw the best conclusion possible; and he feared Mr. Brackenbury had not visited a sufficient number of works before forming his conclusions. Mr. Brackenbury referred to the danger of drawing general deductions, and of making general comparisons, from isolated and insufficient data; and he (Mr. Simmelkjör) was sorry to say he did not think the author had himself altogether avoided that danger. There were, of course, certain differences between Continental and English gas-works, among other things one which the author had not noticed—namely, the size of the coal-stores. This was very easily explained,

because they must have a store for five or six months. In Russia and Sweden, one could see gasholders closed in; but it was wrong to draw from this the conclusion that holders on the Continent were as a rule enclosed. Then, towards the end of the paper, the author summed up by saying that "generally in Continental works there was a more pleasant and tidy appearance, and greater architectural and artistic effect." He could only say, after forty years' experience in Continental works, that he did not find this. There were some better than others; but there were some works in England just as pretty as some on the Continent. In the years from 1860 to 1870, Mr. Kyhnell constructed a good many gas-works in Germany, France, and Russia, and made some very beautiful designs; and if the author had happened to visit one of these works, it would explain his impression. But at the same period there was an English Engineer (Mr. Thomas Hawksley), whose works were far from ugly; and, in fact, they would stand comparison with the finest gas-works on the Continent. He could not agree, either, that Continental managers were more sensitive to answer the calls of modern necessity than British. He found, as a rule, that English gas managers were up to all the new dodges; and when they found a thing paid, they would adopt it. They were not so fond of experimenting as Continental managers. He thought this quite right, for he hated this continual experimenting among managers.

Mr. Brackenbury, in reply, said it was rather a personal matter to refer to his own experience; but for ten years he had done nothing but breathe the atmosphere of Continental gas engineering, and was fairly well saturated with the ideas and doings of Continental engineers. At the same time, he had no doubt, as he had already stated in the introduction to his paper, that many other members were more qualified to deal with the subject. It was exceedingly difficult to make any general survey of these differences without laying oneself open to the charge of limited experience or selection. He had endeavoured to make the best selection he could; and if he had not succeeded, he could only regret it. He had evidently not made himself clear about the 24 hours' work. The differences between stokers' work in England and abroad were very striking. The English stoker worked a large portion of the eight hours' shift during which he was on the premises. But the actual case he referred to was in one of the largest towns in a southern country, with half-a-million inhabitants; and there the stokers did prefer, not to work, but to be on the premises for 24 hours. They actually worked for perhaps ten or twelve hours only; the rest of the time they were amusing themselves, sleeping, or recuperating for doing their agricultural work on the following day. He had purposely over-emphasized certain things, in order to make people think. It was almost a necessity nowadays; and this was his justification for making certain broad statements, with the intention of staggering his hearers, and making them think there might be points in which improvement could be made. He did not plead for ornamentation in gas-works; and he quite agreed with Mr. King that it was simple, practical buildings which they wanted. He thought they might avoid what was grossly utilitarian and ugly, and strive after simple effects, which, being simpler, would therefore be a little more artistic. No one had touched upon his remarks about street lighting, from which he drew the conclusion that they were all ashamed of their efforts in that direction, and preferred not to say anything about it. In referring to Continental works being more sensitive to answer to the calls of modern necessities, what he meant was that in mechanically manipulating material, in stoking, and in other operations, such as condensing and washing the gas, Continental people did seem to be more prepared to go in for improvements. It had just been said that in England they were not so fond of experimenting. This, to his mind, clenched the whole business, and was the very charge he brought (so far as he had made any at all), that in England they lagged behind the Continent in making experiments and scientific researches. With regard to the origin of the Weck valve, as the inventor was born of German parents, he thought the valve might fairly be described as being of Continental origin. It was first of all put into the hands of a German firm, and originally made by them. A paper was read at a Société Technique meeting fifteen years ago, describing the valve as made by the German firm, long before it was dreamed of in England. It was originally in a round form, like the old hydraulic centre-valve; but when Messrs. Walkers took it up, they modified and improved it.

SOME NOTES ON THE CONDITIONS WHICH PREVAIL WITHIN A CARBURETTED WATER-GAS PLANT.

By W. J. Atkinson Butterfield.

A communication dealing with the manufacture of carburetted water gas must almost necessarily be prefaced by a statement of the familiar reactions involved in the production of simple or uncarburetted water gas.

Briefly, 12 lbs. of carbon will react with 18 lbs. of steam to form 30 lbs., or about 760 cubic feet, of a permanent gas, which is water gas of ideal composition. It is made up of 2 lbs., or about 380 cubic feet, of hydrogen, and 28 lbs., or about 380 cubic feet, of carbon monoxide, which is more usually called by technical men carbonic oxide. This reaction will take place directly, completely, and without any other, under certain conditions, of which one of the most important is the presence of a sufficiency of carbon relative to the steam. In the event of there not being a sufficiency of carbon, the surplus steam reacts with carbonic oxide formed according to the primary reaction. If there is a sufficient surplus of steam—that is to say, not less than 18 lbs. (making with the steam for the primary reaction 36 lbs. in all)—this 18 lbs. of steam will react with the whole of the 28 lbs. of carbonic oxide; and the product will be 46 lbs., or about 760 cubic feet, of gas, consisting of 2 lbs., or about 380 cubic feet, of hydrogen, and 44 lbs., or about 380 cubic feet, of carbon dioxide, which is usually spoken of by technical men as carbonic acid. If, therefore, the primary reaction occurs without the interference of the secondary reaction, the 12 lbs. of carbon will have yielded, by the aid of 18 lbs. of steam, about 760 cubic feet of water gas, consisting of equal volumes of hydrogen and carbonic oxide. If, on the other hand, the secondary reaction has interfered to the fullest extent, the 12 lbs. of carbon will have yielded, ultimately, by the aid of 36 lbs. of steam, about 1140 cubic feet of gas, consisting of about 760 cubic feet of hydrogen, and about 380 cubic feet of carbonic acid.

The ultimate product of the action of steam upon carbon may, therefore, have any composition between these two extremes—consistent with there being, for every volume of carbonic oxide present, an equal volume of hydrogen; and for every volume of carbonic acid present, twice that volume of hydrogen. Now, since carbonic acid is a constituent of gas which deteriorates its value for most purposes, and in particular for lighting by means of ordinary burners, gas intended to form a part of a public gas supply must be as nearly as possible free from it. Hence, in order to utilize the reactions set forth above in forming gas suitable for such uses, it is essential that the primary reaction should be allowed the fullest scope possible, and the secondary reaction suppressed as far as may be. While bearing in mind the fact that the secondary reaction occurs only when there is steam present over and above that which the carbon is able to act upon according to the primary reaction, it is necessary to consider the thermal conditions of the reactions. The primary reaction alone involves the decomposition of 18 lbs. of steam, for which about 58,000 units of heat have to be supplied. The combustion of 12 lbs. of carbon to carbonic oxide furnishes about 30,000 units of heat—leaving a balance of 28,000 units, which must be supplied from some extraneous source in order that the reaction may proceed. The primary reaction in conjunction with the maximum interference of the secondary reaction involves the decomposition of 36 lbs. of steam, for which about 116,000 units of heat have to be supplied. But the combustion of 12 lbs. of carbon to carbonic acid furnishes about 97,000 units of heat—leaving a balance of about 19,000 units, which must be supplied from some extraneous source in order that both the primary and secondary reactions may proceed. Hence it appears that the primary reaction alone requires more heat to be supplied than when the secondary reaction interferes. Consequently, in order to prevent the interference of the secondary reaction, extraneous heat must be liberally supplied to the reacting carbon and steam.

In water-gas generators worked on the intermittent system, the heat is supplied in practice by the combustion of carbon within the generator. This combustion, which occurs intermittently with the production of water gas, liberates heat, which is stored up in the unconsumed carbon, &c., the temperature of which becomes very high. The combustion of carbon by the oxygen of the air proceeds very similarly to the reaction between steam and carbon—that is to say, there

is again a primary reaction, the result of which may be more or less supplemented by a secondary reaction. By the primary reaction, 12 lbs. of carbon combine with 16 lbs. of oxygen; and 28 lbs., or about 380 cubic feet, of carbonic oxide are formed. This reaction takes place directly, completely, and without any other, provided there is a sufficiency of carbon relative to the oxygen or air. In the event, however, of there not being a sufficiency of carbon, the surplus oxygen reacts with the carbonic oxide formed according to the primary reaction. If there is a sufficient surplus of oxygen—that is to say, not less than 16 lbs. (making, with the oxygen for the primary reaction, 32 lbs. in all)—this 16 lbs. of oxygen will react with the whole of the 28 lbs. of carbonic oxide, and 44 lbs., or about 380 cubic feet, of carbonic acid will be produced. The ultimate product will in either case be diluted with the nitrogen of the air required to furnish the necessary supply of oxygen. If, therefore, the primary reaction occurs without being supplemented by the secondary reaction, the 12 lbs. of carbon will have yielded 380 cubic feet of carbonic oxide, which will be diluted with about 720 cubic feet of nitrogen. This is producer gas of ideal composition; and it is the endeavour in producer furnaces to form this product. If, on the other hand, the secondary reaction has supplemented the primary reaction to the fullest extent, the 12 lbs. of carbon will have yielded ultimately about 380 cubic feet of carbonic acid, which will be diluted with about 1440 cubic feet of nitrogen. This is spent or chimney gas, of ideal composition; and it is the endeavour in all furnaces to obtain this as the ultimate product which is discharged up the chimney. As the object of intermittently burning the carbon in a water-gas generator is to obtain heat for raising the temperature of the contents of the generator, the thermal conditions of the reactions will indicate whether it is desirable to supplement the primary with the secondary reaction. The primary reaction alone involves merely the combustion of 12 lbs. of carbon to carbonic oxide, whereby about 30,000 units of heat are liberated. If, however, the secondary reaction occurs to the fullest extent, the 12 lbs. of carbon liberate ultimately about 97,000 units of heat. Hence, in order to furnish heat rapidly and economically to the contents of the generator, it is essential to encourage to the fullest possible extent the secondary reaction.

In the production of carburetted water gas, however, it is necessary to supply heat to the apparatus which effects the gasification of the oil, as well as to the contents of the generator. In practice, this is accomplished by bringing about the secondary reaction in the oil-gasifying apparatus—*i.e.*, the carburettor and superheater—instead of in the generator. The extent to which the secondary reaction is effected in either the generator or the oil-gasifying apparatus depends on the supply of air, relative to the carbon consumed, to either apparatus. If there is no oil to be gasified—*i.e.*, if only simple or uncarburetted water gas is to be produced—it is obviously most economical to supply sufficient air to the generator to admit of the secondary reaction having full play there. This is what the Dellwik process for the production of water gas aims at accomplishing. On the other hand, if there is a relatively very large quantity of oil to be gasified, equally obviously, it would be economical so to restrict the supply of air to the generator that the secondary reaction did not occur there, and to effect the secondary reaction wholly in the oil-gasifying apparatus by supplying the necessary air there. This is what the Lowe carburetted water-gas process would endeavour to accomplish for the production of the most highly carburetted water gas. In the light of the investigations hereafter referred to, it may be safely averred that water gas is never carburetted in this country so highly as this theoretical maximum would admit of. Also published records of the Dellwik process show that it does not practically achieve the full attainment of the secondary reaction. That is to say, instead of the maximum 97,000 units of heat being liberated in the generator for every 12 lbs. of carbon consumed, only about 87,000 units appear actually to be so liberated. Hence only about 90 per cent. of the theoretical duty obtainable from the carbon consumed is actually secured in the Dellwik generator. On the other hand, it is practically impossible in practice so to restrict the supply of air relative to the carbon consumed in the generator, that only the primary reaction occurs there. Actually the best working towards this end ever accomplished in the generator, which in this case is acting merely as a producer, would give (say) about 3 per cent. of carbonic acid in the product; and this implies that about 39,800 units of heat have been liberated in the generator for every 12 lbs. of carbon consumed there. This is about 41 per cent. of the 97,000 units which might conceivably be liberated if the carbon were completely burned to carbonic acid in the generator. The 30,000 units of heat which would be the total liberated if the secondary reaction were wholly suppressed, represent only about 31 per cent. of the maximum duty obtainable from the carbon consumed.

These figures indicate that, of the total theoretical heating value of the carbon consumed in a water-gas generator during the blows, the Dellwik process aims at utilizing the whole in the generator, but actually utilizes at the most 90 per cent.; while the ordinary process as carried out in the generators of a Lowe plant, while theoretically utilizing only 31 per cent. in the generator, actually must utilize not less than 41 per cent. Hence it appears that, when it has been argued, from purely theoretical considerations, that the Dellwik process renders available in the generator more than three times as much heat as the ordinary process for every pound of carbon consumed in the blows, an entirely misleading representation of the case has been given, because actually two-and-one-fifth, instead of over three, times is the utmost advantage which it can practically afford in this direction.

Seeing, however, that whereas the Dellwik process may conceivably liberate 90 per cent. of the total heating value of the fuel consumed during the blows in the generator, while under the Lowe system of operating only (say) 40 per cent. may be liberated there, and the balance carried forward to the oil-gasifying apparatus, where as much more as is required for gasifying the oil may be liberated, it becomes important to ascertain how much heat is actually made available under normal conditions for gasifying the oil, and what proportion this bears to the heat liberated in the generator, and to the total heating value of the fuel consumed during the blows. In this manner, it should be possible to ascertain how nearly the Lowe plant—generator, carburettor, and superheater—approaches the Dellwik plant in efficiency when regarded merely as apparatus for utilizing the heat of the fuel consumed during the blows. On this question, the author believes that some analyses recently made by him of the gases formed within a Lowe type of plant throw some light.

The plant in question was one which had, in actual working over an extended period, showed a high efficiency, as judged by a comparison of the works' returns with the results commonly obtained. The plant is that at the Southall works of the Brentford Gas Company, and comprises four sets, each capable of producing 700,000 cubic feet of carburetted water gas per diem. The works' returns show that, during the second half of 1900, the coke consumed in the generator averaged 37 lbs., and the oil 2·89 gallons, per 1000 cubic feet of gas made. The illuminating power of the gas at the time when the samples referred to below were taken, was 19·7 candles, according to the method of testing used at the works. The gas was burnt in the London argand burner at the fixed rate of 5 cubic feet per hour, without purification for the removal of carbonic acid (the percentage of which, however, was only about 1·7), but after removal of sulphuretted hydrogen by ordinary oxide vessels. The gas might, therefore, be considered as equal, after purification, to fully 21 candles in illuminating power. The set from which the samples were drawn was being worked by the usual operator under normal conditions throughout.

The author desires to draw attention to the fact that the plant was being skilfully operated under admirable supervision, lest his subsequent remarks on means by which it seems to him likely that even better results could be obtained should be misinterpreted as casting a reflection on either the design of the plant or on those responsible for the working. The analyses were made by him for the information of the makers of the plant (Messrs. Samuel Cutler and Sons); and he subsequently obtained their permission to publish the results.

Samples of the products of the blow were taken through a pipe inserted through the lid of the generator, so that its end was about 6 inches above the top of the bed of fuel. The product was found to contain, on the average, 68·4 per cent. of nitrogen, 6·9 per cent. of carbonic acid, 22·6 per cent. of carbonic oxide, and 2·1 per cent. of other combustible constituents (hydrogen, marsh gas, &c.). Making allowance for these latter constituents, which would not arise directly from the free carbon of the fuel, it would appear that, on the average, for every 12 lbs. of carbon burnt during the blow,

about 52,500 units of heat are liberated in the generator. This represents over 54 per cent. of the total heating value of the carbon, instead of the 31 per cent. which has been stated in purely theoretical disquisitions to be liberated in the Lowe type of generator, and instead of about 41 per cent. if the generator were acting as a very good practical producer. The 54 per cent. is, however, considerably less than the 90 per cent. which might be attained by the Dellwik process; and it is necessary to ascertain to what extent the balance of available heat is utilized in gasifying oil.

The supply of secondary air to the carburettor and superheater of a Lowe plant in good running order is tolerably uniform, being so maintained that carbonic oxide is burnt during the blows within these vessels in sufficient quantity to raise their refractory contents to a sufficient temperature to gasify the oil and fix the oil gas. Clearly the quantity of carbonic oxide burnt must vary with the quantity of oil to be gasified per run—that is to say, *cæteris paribus* with the candle power of the gas which is being made. In this plant, gas of about 21-candle power was being produced. This is probably about the average quality of the carburetted water gas made at the present day in this country, though when carburetted water-gas plant was first introduced, the gas made was considerably richer, and hence more carbonic oxide must have been consumed for the gasification of the oil. Samples of the product from the Southall plant, taken from the upper part of the superheater during the blow, showed the following average composition (after eliminating a small percentage of hydrogen, &c.): Nitrogen, 73·5 per cent.; carbonic acid, 10 per cent.; carbonic oxide, 16·5 per cent. This composition indicates that, up to this point, the heat liberated has amounted to about 60,500 units for every 12 lbs. of carbon consumed during the blow. This represents over 62 per cent. of the total heating value of the carbon. But as 54 per cent. had been liberated in the generator, it appears that only 8 per cent. was liberated in the apparatus for the gasification of the oil, while the carbonic oxide discharged through the stack-valve of the superheater represented 38 per cent. of the total heating value of the fuel consumed in the blows. It has already been indicated that the Dellwik process does not in practice utilize the maximum by 10 per cent.; and it may be granted that it would be practically very difficult to approach nearer the theoretical maximum duty than the 90 per cent. which may be realized in the Dellwik plant. This leaves 28 per cent. of the heating value of the fuel consumed during the blows, which appears to be lost in a good Lowe plant, and might conceivably be utilized.

A certain margin, however, must evidently be allowed to meet a sudden call for more heat in the carburetting chambers at any time; but there seems to be no question that from 20 to 25 per cent. of the heating value of the fuel consumed during the blows is at present needlessly wasted. As it is not wanted for gasifying the oil, an endeavour should be made to liberate it in the generator. This could theoretically be accomplished by supplying air more freely to the generator during the blows. The aim should be to supply sufficient air to the generator to supplement the primary reaction to such an extent by the secondary reaction that fully 75 per cent. of the heating value of the fuel will be liberated in the generator. That is to say, the products of the blow at the top of the generator should have approximately the following average composition (after eliminating whatever other constituents are present): Nitrogen, 74 per cent.; carbonic acid, 13·5 per cent.; carbonic oxide, 12·5 per cent. In analyses for controlling the working of the blow, it would, of course, suffice to determine the carbonic acid in a sample taken from the top of the generator about the middle of the blow. The carbonic acid should amount to about 13 per cent. of the sample. If this average proportion were maintained in a set of the capacity of those at Southall, engaged in making gas of about 21-candle power, the author is of opinion that the maximum efficiency for the blows would be secured. As the heat liberated in the generator would amount to 75 (instead of 54) per cent. of the total heating value of the fuel consumed in the blows, the bed of fuel would be raised to the desired temperature more rapidly than at present. Hence the blow, which at Southall lasted four minutes, could be shortened to (say) three minutes.

While a more liberal supply of air to the generator is under consideration, it is desirable to bear in mind that, given a uniform supply throughout the blow, the proportion of carbonic acid in the product, and hence the heat liberated in the generator, decreases as the blow proceeds. In the Southall plant over 60 per cent. of the total heating value of the fuel was liberated in the generator at the commencement of the blow; while towards the close less than 50 per cent. was so liberated. In other words, as the temperature of the bed of fuel rose, the generator became more efficient as a producer, and a greater proportion of the heating value of the fuel was carried forward in the producer gas. Hence if it were considered desirable to maintain uniformly throughout the blow the above-named 13 per cent. of carbonic acid in the product from the generator, it would be necessary to maintain a gradual, but considerable, increase in the supply of air as the blow proceeded. It is, however, questionable whether it would be worth while endeavouring to maintain uniformity of composition of the product from start to finish of the blow.

Reverting to the conditions attending the run or make of gas, it is well known that the percentage of carbonic acid in the gas made increases as the run proceeds. This is due to the reduction of the temperature of the bed of fuel owing to the great abstraction of heat therefrom necessary for the primary reaction. If the steam supply is maintained constant throughout the run, and at the commencement is adequate to secure a full make of good water gas, the heat abstracted from the bed of fuel will soon reduce its temperature to such an extent that it will no longer be able to supply the heat needed to maintain the primary reaction for the same quantity of steam, and the secondary reaction, which entails a smaller supply of extraneous heat, will begin to manifest itself.

If the run were continued indefinitely, the secondary reaction would interfere to such an extent that the carbonic oxide resulting from the primary reaction would be entirely suppressed. If, however, as the temperature of the bed of fuel became lowered, and its power of supplying the heat necessary to support the primary reaction became lessened, the supply of steam were reduced, the interference of the secondary reaction would be avoided. It would thus be possible, by gradually reducing the supply of steam to the generator, to continue to make good water gas for a much longer period than the usual duration of a run; but, of course, the make of gas would gradually fall with the supply of steam, so that a practical limit to the extension of the run by this means would soon be reached. Nevertheless, whereas seven minutes is at present commonly the length of the run, and the carbonic acid in the gas reaches (say) 7 per cent. at the end of such a run, the author believes that it would be economical to reduce the supply of steam gradually as the run advances, and to continue the run to eight or even ten minutes, while maintaining the maximum percentage of carbonic acid in the gas well below the above figure. The Southall plant, during a seven minutes' run with a constant supply of steam, made gas containing, on the average, only 1·55 per cent. of carbonic acid and sulphuretted hydrogen—the percentage ranging from 0·66 during the first minute to 3·42 during the seventh minute. Seeing that, in practical working on a large scale, it has been found possible to reduce the interference of the secondary reaction to the extent indicated by these figures, the author believes that a gradual slight reduction of the supply of steam will make it possible to extend the run in such a plant without increasing the percentage of carbonic acid in the gas made.

It is evident that when the interference of the secondary reaction of the run is almost wholly suppressed (as was the case with the Southall plant when these investigations were proceeding), the cost of removing carbonic acid from the gas by means of lime will be no greater than the cost of purifying coal gas by means of lime. On the other hand, so small a percentage of carbonic acid as was found at Southall would not greatly deteriorate the lighting value of the gas if it were left in it—as, indeed, is the practice at Southall.

In conclusion, the author would summarize his suggestions for improving the present results of the working of carburetted water-gas plant, as follows: 1. The steam supplied during the run should be gradually reduced as the run advances. Whenever the gas produced (if blown off from a cock on the generator lid) visibly contains steam, it is an indication that more steam is being admitted than the carbon of the fuel-bed can deal with; and it may be taken for granted that the secondary reaction is happening to an undesirable extent. 2. The run should be extended by from one to three or more minutes beyond its present duration—regard being paid throughout to the first suggestion. 3. Air should be supplied more liberally to the generator during the blows, so that in

a set designed to make half-a-million cubic feet or upwards of 20-candle power gas per diem, the products of the blow at the top of the generator should contain about 13 per cent. of carbonic acid. 4. The working of the generator should be controlled by testings at regular intervals of the percentage of carbonic acid in the products at the top of the generator during both the run and the blow.

It seems to the author that, if these suggestions were carried out, the productive power of a given plant would be considerably increased, while a saving of from 3 to 6 lbs. of fuel per 1000 cubic feet of gas made would ensue. He, therefore, ventures to offer them, in the hope that any gas engineer who may deem them, on consideration, worthy of a trial, may find some practical advantage result.

Discussion.

The PRESIDENT said they were very much indebted to Mr. Butterfield for bringing forward the results of these experiments made on a practical scale with large-sized plant. He certainly suggested some novel views with regard to the working of water-gas apparatus; and, on the face of them, they seemed to him most sound. It stood to reason that, when they were blowing up the producer, and the fuel was becoming incandescent, they wanted more air as the process was accelerated; and likewise, when turning on steam and taking the heat from the incandescent fuel, they should gradually reduce it. Whether they should do this by putting a skilled assistant in charge to regulate these valves, or whether some means could be devised which would automatically regulate the apparatus, was quite another matter. Automatic regulation was what they would desire, as they were not all blessed with a large staff of skilled assistants. Mr. Butterfield seemed to think that by tackling the job once a week or so, they might find out how the men were regulating it, and in a crude way determine the periods and proportions of the two. At any rate, the matter was well worth discussing.

Mr. F. W. CROSS (Lea Bridge) said it had appeared somewhat superfluous that they should have two papers on carburetted water gas at the same meeting; but any such feeling was entirely removed by the character of the paper just read to them. This paper presented certain facts derived from the author's experience; and he placed divers theories before them as facts, which would help those who had water-gas plants to come to a conclusion on what they observed. There were many points that were made clear to him, and which had occurred in practical working. There was the question of the duration of the blows—whether it should be three or four minutes. In many cases they found that, after working for four minutes, it was an advantage to revert to three-minute blows. Why was this? Mr. Butterfield had very well explained why it should be so, though to practical men this had not been very clear. They owed him a debt of gratitude for bringing the facts before them in such a lucid manner. To his mind, the paper was worth a great deal for the one statement alone with regard to the diminution of the steam during the run. There was no doubt it must have an appreciable effect on the amount of carbonic acid made; and the difficulty they all met with was to keep down the carbonic acid. The whole of the testing of the gas was made with this object; and if they could keep it down to 1½ per cent., they would be very glad. The author said he could bring it down to 1·55 per cent., which was unusually good working; and he wished he could do it himself. If they could secure this, a great problem with regard to carburetted water gas would be solved, and they would feel they were approaching the millennium in water-gas manufacture. The purification of water gas was a very serious matter. Some did not purify it at all; others purified the whole, and took out all the carbonic acid; and others took out a portion. If they could secure a gas with only 1½ per cent. of carbonic acid, they would be very well satisfied. The author appeared, by his remarks, to cast a certain amount of disparagement on the Lowe plant as compared with the Dellwik; but this might be more apparent than real. The Dellwik plant was supposed to give up 90 per cent. of its heat in the generator; while the Lowe plant gave out a total efficiency of 68 per cent. when used in heating the generator, carburettor, and superheater, 41 per cent. only of which was used in the generator, leaving 32 per cent. that might be used to heat the carburettor and superheater, but a portion of which went to waste. He would like to know how, in the case of using a Dellwik generator, he was going to heat his carburettor and superheater with only 10 per cent. of the total heat. He must continue the blow of the Dellwik generator until he got the secondary reaction spoken of in the generator, when there would be more waste from the Dellwik in giving the heat necessary for the carburettor and superheater, and it would be necessarily impossible to obtain an efficiency of 90 per cent. in the generator.

Mr. T. HOLGATE (Halifax), in thanking the author for his paper, said perhaps the principal conclusion to be drawn from it was the confirmation of what he stated in his own paper—that there was a considerable improvement possible in water-gas plant. One instance of this was here given, to be derived from the slowing-down of the speed of the steam during the run. It would be quite possible to superheat the steam as he (Mr. Holgate) advised, and also diminish its rate of flow towards the end. In the experiments which Dr. Strache recorded, he clearly set forth the great importance of the steam traversing the fuel at a slow speed. He took it, however, that the output of water gas per day would be slightly less under such conditions, though probably it would be a better gas. On the other hand, there would be something gained in the efficiency of the generator during the blows. So that one might be set against the other, and they might anticipate about the same daily output with a reduced quantity of carbonic acid and a less consumption of fuel. The tendency in the future might be to knock off some of the oil now used, and make the gas of lower illuminating power. If that were done, it would become all the more necessary to make the generator as efficient as possible, though at present there was but a small quantity of heat used in the gasification of the oil and fixing it in the superheater. However, this amount (which was comparatively small) would be less for a lower illuminating power. At the present time, a large portion of the heat generated in the producer was sent up the chimney. According to Mr. Butterfield's figures, he calculated that about 8 per cent. of the heat value of the fuel was used in the carburettor and superheater; but from this a deduction would have to be made for radiation in the plant. Of course, this was only a gross estimate. Even taking it at 8 per cent., it was a small fraction. Mr. Glasgow's figures, as set out in his paper, showed that only 11,776 units were actually employed in the gasification of the oil, out of 340,000 units supplied by the fuel—or about 3½ per cent. of the total heat value.

Mr. D. H. HELPS (Redhill) asked, in connection with the small amount of carbonic acid found in the plant at Southall, what was the nominal capacity of the plant as given by the makers, what was its capacity at the time the tests were made, and what was the rate of production. It was quite easy to keep down the carbonic acid if they also kept down the quantity produced.

Mr. J. W. HELPS (Croydon) said he could only add his praise of the paper to that already expressed. It seemed to him that the author had given information which must be of great use. In the first place, the paper was an able defence of the Lowe plant as compared with others, such as the Dellwik, for the author had shown that the actual efficiency obtained was greater than had been supposed. With regard to the carbonic acid, it after all resolved itself into a question of £ *s. d.* Roughly working out the actual available result from a gallon of oil in the Southall plant, and taking the gas at 21 candles, it appeared to come to something like 7·3 candles per gallon. At Croydon, they were able to obtain somewhat better results than this, though the carbonic acid generally averaged 3 to 3½ per cent. It would, therefore, appear that, though it was possible to work in such a way as to reduce the carbonic acid to the lowest limit, the actual result was none the better in the end. With regard to the heat which was lost, he took it, from the remarks made by Mr. Holgate, that the greatest amount of heat which could be used in gasifying oil was about 11,000 units. As Mr. Butterfield pointed out, there were some 28,000 units which escaped from the superheater, and which might be utilized. He did not know whether it would be possible to use some of it in connection with still further heating the oil, which at present was heated in the well-known oil-heater in the down-pipe from the superheater, or whether it could be utilized to raise the heat of the oil in such a way that it could be injected under better conditions into the carburettor itself. Such a paper as Mr. Butterfield's was an able defence of certain remarks which occurred in Mr. Brackenbury's paper, and showed the necessity of better training, not only of pupils, but of all who had to accept situations in gas-works under a manager. Those who worked water-gas plant had hitherto been going on rule-of-thumb

principles; they had been perfectly content to accept as a standard the best-known results of their competitors, or of those working under similar conditions. If one man was able to obtain 7 candles from a gallon of oil, and another could obtain 7·1 candles, he laid the flattering unction to himself that he had got as near perfection as possible. But it was really necessary to have theoretical information, such as the author had given them, to show that an arbitrary standard like this was really no use at all. They wanted to know the utmost possibility at which they could aim; and then they would be in a better position to so mould their work as to get as near this as practicable. They were much indebted to the author for the experiments he had made, and for coming forward to show them how much they had yet to learn, and what a possibility there was in connection with water-gas plant. At present there was a great diversity of opinion as to whether water gas paid; but they were working under conditions not absolutely satisfactory. They had not got to anything like perfection. There seemed still a great deal to be hoped for; and he felt confident that, if only they could, through the medium of such papers as the present one, get better working, water gas was going to form even a more valuable adjunct to the plant of a gas company than it had yet proved.

Mr. Butterfield, in reply, said he highly appreciated the remarks which had been made, and the friendly reception accorded to his paper, which he brought forward with some diffidence at the last moment—it was, in fact, entirely written in one day. He owed an apology to Mr. Holgate for presenting a paper the subject-matter of which was really covered by his, which went a great deal further. With regard to the automatic regulation of the steam and air supplies referred to by the President, this was already under consideration by one of the makers of the plant; but, so far as he knew, no practical application of the idea had yet been made. The principle would be tried with some new plant. With regard to Mr. Cross's question, he thought he had not quite followed the paper. He did not advocate adopting the Dellwik principle to such an extent as to liberate 90 per cent. of the heat in the generator, but expressly said he thought it should be so far adopted that 75 per cent. was liberated there for a plant of that capacity. With very much smaller apparatus, he imagined more heat must be carried forward, because the radiation would be so much greater relative to the capacity of the plant. This brought him to Mr. Holgate's remarks. He had expressly left out of consideration any such points as radiation; and his figures only applied to plants of that size, or thereabouts. Smaller plants would need a separate investigation. In a very much smaller plant, he found on one occasion only about 6 per cent. of carbonic oxide discharged through the stack-valve. No doubt the difference between 3½ per cent., which Mr. Glasgow gave, and the 8 per cent. was almost wholly due to radiation. The nominal capacity of the plant was, he believed, 600,000 cubic feet; but it actually had made 700,000 cubic feet. He could not off-hand give the make at the time he took the samples; but the Gas Company had no idea he was going to take them that day, and the plant was working in the ordinary way. If desirable, he would endeavour to get the day's make from the Manager. He quite agreed they had not nearly got to perfection; but he found this plant was very efficient, and many people who were dissatisfied with the operation of carburetted water-gas plant were working much less efficiently. In some cases he had had occasion to investigate to an extent, he had found very strange results; and he was quite sure that in very many instances the oil put in was wasted. For example, where a supply of 14-candle gas was required, in some cases the company were distributing 20-candle mixed gas, which, of course, made carburetted water gas appear costly.

THE PROGRESSIVE AGE.

By J. D. Ashworth, of Portsmouth.

The subject selected for this paper forms one of the most vital problems for the future welfare of the gas industry, and has been approached by the author more from an industrial point of view than upon scientific lines.

For some considerable time many gas undertakings have fallen into a somewhat stagnant condition, although there are instances where increasing growth of business still continues. But, on the other hand, there are cases which indicate a downward grade. One would naturally think that with the increase of our commerce and growth of our towns, so should our industry develop; but it is very questionable indeed if we are progressing in anything like the same ratio.

To give a true definition to each of the foregoing stages of affairs would be a most difficult and unsatisfactory task to accomplish. Conditions vary so considerably in different towns, and what applies in one place does not always do so in another. However, no doubt much of last year's falling-off can be accounted for: Firstly, by the exceptionally mild weather which was experienced generally in the closing months of the year; secondly, by the increased price charged for gas by many undertakings, which was unfortunately compulsory through the heavy burden thrown upon purchasers by the exorbitant prices paid for raw materials generally; and, finally, to the advancing strides made by electricity.

Undoubtedly those undertakings which have made the most rapid progress, and have not felt the effects of electricity and other rivals, are those which have established the slot-meter system and hiring of cooking stoves on a large scale, and have also extended the supply of gas into new districts, to compensate for those which have adopted other methods in preference to using gas.

Much of the sluggish condition of affairs which now exists with many undertakings could, in the author's opinion, be overcome if we were, as an industry, to more seriously consider our present position, and adopt a more stringent method of overcoming the difficulty. As business men, it is no use closing our eyes to the fact that electricity is making most rapid strides. It is creeping into first one place and then another, and is superseding the use of gas in many directions. Its adoption is being pushed by local authorities—irrespective of their being the owners of the electricity supply—whether it be for lighting or motive power, and not regarding the extra cost incurred by using it in preference to gas. The question of electricity undertakings being a financial success is very doubtful indeed. In the case of those owned by local authorities, if they are worked at a loss, so as to meet the requirements of consumers, other departments or the rates make up the deficiency.

Many of the consumers of electricity have discarded gas, not altogether because the light evolved by electricity is superior to that of gas, when the latter is used in conjunction with the incandescent system, or from motives of economy, but simply to go with the times.

The threatened introduction of "free wiring" for electric lighting into the working-class and poorer districts, is most absurd; and any right-thinking person knows very well that electricity is too expensive for this class of consumer to adopt for his own financial interest. At the same time, there are many houses which are inhabited by the middle classes where this indulgent method of lighting is being instituted, irrespective of the additional expense it incurs over that of gas. Of course the author is fully aware that in the case of hotels and mansions electricity is used largely for illuminating purposes. In the case of the former, it is an advertisement to residents; while in the latter, it is simply a matter of luxury.

Leaving our lighting competitor behind, we have electric motors and other appliances to compete with. These electrical motors are being largely used, and are making most rapid progress as compared with the smaller size gas-engine. We are also face to face with another rival in the form of a non-luminous gas, known as Mond gas. Although its initial efficiency may not be equal to that of coal gas, yet, should it be used to any extent for domestic and industrial purposes, it will considerably deter the progress of many undertakings which sell gas largely for cooking and motive power. We all know very well that manufacturers are ready to entertain new methods of producing motive power at a low rate, which is only natural in these competitive days. Therefore, in view of Mond gas being introduced, we should be prepared with a substitute to place before our customers. The author is often amused when he hears brother engineers say "there is room for both"—meaning, presumably, that the electric light shall do the illuminating, and gas the cooking and motive power. That sounds very well, until electricity becomes more largely employed for motive power, and also receives the support of another rival, a non-luminous gas, which steps in and interferes with our progress.

The author fears that we have accepted our rivals in too friendly a way, and have also allowed our customers to dwindle away, one by one, without offering sufficient resistance. This attitude of supineness is certainly a mistake,

as the days of monopoly have long since passed away. "Help one another" is all very well; but our present position is such that the policy of "Heaven helps them that help themselves" will be a more fitting motto. At the same time, to attain success and supremacy, "Forward" must be our watchword.

Although a deep lover of his Mother Country, the author certainly thinks that, as a nation, Great Britain is far behind our Continental friends in many scientific subjects. In his opinion, the time has now arrived when a scheme should be considered, by our industry, for universally following the principle adopted by some of our German friends, in the establishment of a low-grade standard of gas—say, of 10-candle power. Of course, parliamentary powers would have to be obtained before this could be done; and periodical reductions in the illuminating power would have to be made, until the minimum quality was arrived at. This would prevent any sudden shock, or interference, to the consumer. By adopting such low-quality gas, we should be midway between the non-luminous gas for cooking and industrial purposes and the illuminating section of our industry.

The difficulty of educating the consumers to a low-quality gas would soon be overcome, more especially if their requirements in the form of "cheap gas" were met. The use of such a gas would permanently establish the incandescent system of gas-lighting, and would receive additional support owing to the low price at which incandescent burners and mantles will be obtainable as time proceeds, and they are brought more into daily use. At the same time, a much superior light would be produced with the incandescent system; and if the selling price of gas could include a specified number of mantles, for renewals for each burner, based on the size of the consumer's meter, it would considerably reduce the number of complaints now received of "bad gas," and which are due more to inexperience of consumers than to any other cause. The changing of mantles, and blowing-out of the incandescent burners, could be performed by the meter inspectors when visiting the consumer's premises for meter-reading. A higher calorific value would be obtained with a low-grade gas, and would be more advantageous for domestic and industrial purposes.

The author is fully convinced that, if any substantial inducement could be offered to consumers, whereby a material saving could be effected by the use of gas in preference to rival illuminants, many of the so-called "lost consumers" would again readily adopt the use of gas.

The author has no hesitation whatever in saying that a low-quality gas, such as that referred to, could be produced and sold at 25 to 30 per cent. below the price now charged for a 15-candle power gas, and would give a profitable remuneration.

A low-grade gas would have several advantages, in competing with the electric light and such a non-luminous gas as the author has referred to. Being supplied through one meter, it would do either for lighting, domestic, or industrial purposes. Being cheap, it is very questionable if consumers would be troubled with two or three accounts and meters in their premises. The adoption of this low-grade gas would therefore not only enable us to compete with rivals, but would undoubtedly increase the consumption of gas very considerably indeed. The saving in cost over electricity for lighting purposes would be very marked; while, for motive power, there would be the advantage that, in competing with a non-luminous gas, a 10-candle power coal gas would not be much more expensive, and would do the double duty for lighting and power if required.

As an industry, we are being enlightened daily upon the policy of lowering the present standard of light; but it is very questionable if we are rapid enough in our actions to prevent rivals making the headway which they now do. In the issue of the "Gas World" of March 2 this year, a very strong comment was made upon the lassitude with which gas engineers regard the question of lowering the present quality and establishing a low-grade gas. In the author's opinion, the comment referred to was most justifiable. However, something has been done, as may be seen in the policy adopted last year by the South Metropolitan Gas Company, in seeking power to reduce their illuminating power two candles below their present standard. Although this reduction was hardly so much as the author recommends, yet it is certainly a step in the right direction; and this example will no doubt be followed by many undertakings before long, and will eventually lead to the establishment of a lower standard gas than is now employed.

So confident is the author on the subject of reducing the present candle-power of gas to a lower grade than that now supplied, and the success that would be attained by its adoption, that in the autumn of last year he advised his Company to consider the establishment of a 10-candle power standard gas. The benefit which would be derived would be ample reward for the change; while, in the case of large manufacturing towns, the advantages would be very considerable indeed.

One thing may assuredly be said with regard to a high-quality gas of 19 or 20 candle power, compared with the 14-candle power gas as supplied at Portsmouth. When they are each consumed with an incandescent burner and mantle, and under similar conditions, the latter is found to be equally as brilliant as the higher-grade gas referred to. The author has not had an opportunity of testing a 10-candle power gas on similar lines and conditions; but it is very evident that the practice adopted on the Continent with 9 or 10 candle power gas is sufficient proof to justify its adoption in England.

From a manufacturing point of view, in the production of low-quality gas the expensive enriching materials which are now used, and which are almost unobtainable unless ridiculously high prices are paid, would not be required. Then, a certainly lower class gas coal could be used than is now employed. The arrangement of carbonization would undoubtedly revolutionize the present method; and the introduction into gas-works of settings similar in form to coke-ovens (only set at an inclined plane) would no doubt be established for reducing the cost of carbonization, and labour generally would be reduced to a minimum.

Discussion.

The PRESIDENT said at the outset he did not quite see how they could lament the decay of an industry which had increased at the average rate at 4·2 per cent. per annum during the last ten years. There was no doubt electricity did gain ground, and was rapidly advancing. There were many points in the paper worthy of consideration.

Mr. J. FERGUSON BELL (Derby) said they must all agree with many of the points raised, particularly with reference to the competition of the electric light. No doubt as time went on this competition would be more severe, and they would have to strive their utmost to maintain the lighting business. He referred particularly to those towns where the gas supply was in the hands of a private company, and the electric lighting in the hands of the corporation. In many places they had displaced gas lighting for electric arc lamps which were charged at an extravagant price, and thereby enabled corporations to show fictitious profits on their electricity accounts. The extra price for the street lighting was really a tax on the gas company. There was no department of gas lighting which was a better advertisement than good public lighting; and gas engineers ought to take steps to show what could be done by incandescent lighting and other means, so as to maintain their position. The competition was often very unfair—for instance, in what was called free wiring. If this were introduced, the consumers ought to be charged for it in the same way as for the penny-in-the-slot meter, bearing the full cost of the additional capital outlay. One of the important points raised was the use of gas for power. No doubt they were losing many customers because in some places the electric light companies and corporations charged only 1d. or 1¼d. per unit for electricity used for power. Of course, it improved the load factor, and therefore reduced the cost all round; but 1¼d. was really less than the manufacturing charges. This was very unfair competition, and should be met by gas companies charging differential prices for gas used for motive power. The best customer a gas company could have was a gas-engine; and next to that, a cooking-stove. He could not agree with the suggestion of reducing gas to 10-candle power, though no doubt there might be a reduction. He thought that 14 or 15 candles, as a rule, would meet the case. The author also raised the question of Mond gas; but this ought not to be referred to as a new gas, since it had been for fourteen years before the public. There was a Bill before Parliament now in which Mond gas was represented to be the salvation of the South Staffordshire district. He could only say that the district would be in a very bad way, if that was to be their salvation. It was exactly similar to producer gas; and if any manufacturer wanted it, he could put down a Wilson producer, or any of the numerous forms of producer, and make gas himself for

½d. or ¾d. per 1000 cubic feet; whereas the Mond Company were going to charge 1½d. or 2d. If the Bill passed, it would be interesting to watch the result of distributing gas which contained so large a proportion of inert gases as 60 per cent. of nitrogen and carbonic acid. It ought to be pointed out that the gas possessed only one-fifth the calorific power of coal gas; and when cold it would hardly burn. He believed it would cost about £10,000 to put down Mond plant to gasify 50 tons of coal every 24 hours; while two Wilson producers would only cost some £250 each, which would produce gas identical so far as calorific power was concerned. The only difference was that the Mond process recovered the ammonia. But the result of putting down a large installation of Mond plant, would be a very considerable increase in the production of sulphate of ammonia, which would probably bring down the price seriously. This, of course, would prejudicially affect the Mond Company, because ammonia was their sheet-anchor. He agreed with many of the suggestions the author made, and thought gas engineers ought to adopt a more forward policy, and come more in contact with the consumers. The idea of maintaining incandescent burners at a fixed charge per quarter was a good one; and he believed it had been adopted, with admirable results, at Sheffield.

Mr. W. Doig Gibb (Newcastle) thanked the author for suggesting that gas engineers should endeavour to find out how they could improve the popularity of gas as an illuminant and for general purposes, but did not agree with him in many of his conclusions. Generally speaking, the paper dealt with the competition between electricity and gas; but he was surprised that the author should be amused at hearing a brother engineer say there was room for both. He thought future years would prove that there must be room for both; for they must all acknowledge that electricity had come to stay. He was rather diffident in giving his own personal experience; but it was a curious fact that for the last ten years at Newcastle they had had the active rivalry of two Electric Lighting Companies, and in spite of this their percentage of increase of gas consumption had been much greater than in the previous ten years. In fact, the average annual increase had nearly doubled itself since the advent of the Electric Lighting Companies. He attributed this to the public now demanding more light. In former years, many were content with one small burner; but the glare of light to which they had been lately accustomed, and which had been made principally by people who were quite independent of the cost, had educated them up to the fact that they could have, and required, more light, and no doubt gas had indirectly benefited. With regard to power, this was a more serious question. The Company he represented happened to have, as one of their customers, one of the largest gas consumers in the world. Their consumption was nearly 300 million cubic feet a year. It was not an unmixed blessing to have such a large consumer; but quite recently he had it from one of the officials of the Company (who collect the most careful statistics with regard to every point in their business), that they had ascertained definitely that at the present price of Newcastle gas it was by far the cheapest source of power for all ordinary purposes. They had compared it with producer gas, electricity, steam power, compressed air, and all other forms of power available. In answer to a question, Mr. Gibb said the present price was about 1s. 9½d. per 1000 cubic feet; and no differential rates were given for lighting, heating, power, &c. The consumer he referred to got no benefit over one who only took 400,000 cubic feet per quarter. He did not agree with this latter condition; but it was the rule, as laid down by their Act of Parliament. He could not conceive how the author could advocate a 10-candle gas standard. The most sensible standard to employ was the one which would result in supplying the cheapest gas to the community; and this gas would be the one which could be naturally produced, without artificial enrichment, from the cheapest available coal. This being so, he could not see that 10 candles would be a proper standard for the country generally. The South Metropolitan Company had recently gone to Parliament and received sanction for a reduction from 16 to 14 candles; and it was stated in evidence that, if they were allowed to make 14-candle gas, they would be able to manufacture the cheapest gas from the cheapest available coal. He failed to see how anyone could produce cheaper gas than this. It must not be forgotten that the community had been educated up to a certain standard of candle power; and a gas company could not suddenly alter it. Any reduction must either be made very gradually or they must undertake to supply new burners and other material suitable for efficiently burning the cheaper gas. It was unfair to the community to call upon them to invest their money in certain articles which would best consume the gas at that time being supplied, and then, without any warning, to lower the candle power to such a degree as to render the articles in use of comparatively little value. In his concluding remarks, the author had suggested the introduction into gas-works of settings similar in form to coke-ovens, but set at an inclined plane. He should much like to know if there were any experiences in favour of the adoption of such a method. The President had had experience of Edinburgh coal; and this no doubt was admirably suited for inclined retorts. But he (Mr. Gibb) might state most emphatically that there were coals not adapted for inclined retorts, and members should not go away with the idea that inclined retorts were the correct thing in all circumstances. They must consider the available coal supply, and be assured of a sufficiency of suitable coal from various owners; otherwise, even if one coal were found suitable, they would be too much in the power of those from whom they had to procure it. There was a great deal of Durham coal absolutely unsuited for inclined retorts, and which gave much better results with horizontal retorts worked by power.

Mr. F. W. Cross (Lea Bridge), while complimenting the author on his paper, said he joined issue with him where he stated that for some time many gas undertakings had fallen into a stagnant condition. He must absolutely deny this. It had been the object of gas companies and gas engineers to force the matter of the better and greater use of gas on consumers; and such a statement was a libel upon them. Personally, he did all he could in working the consumers up to a better knowledge of the use of gas as compared with the electric light; and he felt perfectly sure that all present could say the same. The author was amused at the statement that there was room for both gas and electricity; but the fact was there must be room for both. His idea of room for both was that gas should take the first place, and stop there; and that was, he thought, the spirit that should animate them all in their competing with the electric light. He was at present in front of the electric light, and he intended to keep there. There were many ways of doing this which were patent to everyone, and which he need not enlarge upon. The introduction of 10-candle power gas would be absurd. It might be done many years hence; but at the present moment, it could not. They had to make a gas which could be used with ordinary burners; and for this purpose a quality of 14 candles was as low as they should think of going. The author went to the Continent for his experience of 10-candle power gas; but what did they find there? They were using incandescent lights in nearly all the towns. Now in England, the mantle was the great consideration. They had to pay 5d. or 5½d. each for them; but on the Continent they got them at 1½d. or 1¾d. When a similar point was reached in England, they could afford to do with the mantle as they now did with the burners—send an inspector round and give the mantles away. This time would surely come, and he hoped shortly. Then they would be able to reap the benefit of incandescent lighting. The author attributed the falling off in the use of gas to the advancing strides of electricity; but he (Mr. Cross) did not altogether agree with that. Electricity, of course, was making its way side by side with the increasing sales of gas; but the growing use of incandescent burners led to a smaller consumption of gas, and therefore merely checked the increase which would otherwise have taken place. This would all be recovered by a more satisfactory and stable business.

Mr. J. L. Chapman (Harrow) said there was no doubt that the effect of electricity on gas lighting was to reduce the output temporarily; but there were two sides even to this question. He was connected with a large Suburban Company. Some eight years ago, previous to the advent of the Electric Lighting Company, the increase per annum was about 2½ per cent.; but since then it had been sometimes 8 and sometimes 15 per cent. He believed that people came to live where the electric light was; they liked it for certain purposes. He had £1000 rental per annum taken away when the Electric Light Company started business; so that it was a serious item. But not even on that occasion did the increase in the sale of gas fall off. It had gone on continuously increasing, and was now larger than ever. Most probably the loss from people using electric light was

more than made up by the use of gas for cooking and heating stoves. He was not of opinion that electricity would seriously affect gas companies for public lighting in the incandescent form, which some suburban companies fancied. The town of Watford used to be nicely lighted; but now it was an electric-lit town with two incandescent lights in every lamp. They were supposed to give 16-candle power; but they were not equal to an ordinary gaslight burning about 5 cubic feet per hour. The light was utterly insufficient. Of course, the light was enclosed in the lamp, and this was again enclosed in the lantern, which probably prevented a great portion of the light coming through. At any rate, it was certainly a very inferior light to gas.

Mr. ASHWORTH, in thanking the members for their remarks, said his principal idea was to point out that they should be more on the alert than they had been, now that they had electricity to compete with. With regard to the President's statement that the increase was 4·2 per cent. per annum, his idea was that it ought to be considerably more. Of course, they knew there was room for both electricity and gas; and he agreed with Mr. Cross that gas ought to be foremost. But probably electrical engineers would say the same thing for their profession. He did not wonder at people not using electricity when they could get gas at 1s. 9d. per 1000 cubic feet. With regard to the change of burners, this would have to be made. A lower quality gas would require suitable burners. In regard to stagnation, he did not say there was absolute stagnation; but recent progress was most certainly not so rapid as in his opinion it ought to be.

Coal Production in the United States.—The total production of coal in the United States last year is estimated at 274,872,000 tons, as compared with 252,115,000 tons in 1899. This is the largest output on record; and it is suggested that, though the British mine owners may not have felt American competition very much at present, owing to high rates of freight and the difficulties attending the introduction of a new article, the case will be different in a few years' time, when American coals have an established market, and the great companies have colliers specially built for the foreign trade. The export during the year is returned at 7,917,319 tons, as compared with 5,752,150 tons in 1899, and 4,503,405 tons in 1898.

Manchester District Institution of Gas Engineers.—The 126th quarterly meeting of the Institution will be held next Saturday, when, as usual, at the spring gathering, the members will make an excursion. We learn from the programme issued by the new Hon. Secretary (Mr. J. Wilkinson, of Drighlington), that the members will leave Manchester for Skipton, which will be reached about eleven o'clock. Coaches will be in attendance to convey the party to the Black Horse Hotel, where luncheon will be served, and the few items of business on the *agenda* transacted. These will comprise the election of three new members, and the consideration of a resolution to forward a communication to the makers of gas-meters in England, asking them, in the interest of all parties concerned, to adopt the series of interchangeable meter-unions accepted by the North British Association. It is presumed that these matters will not occupy much time, for the coaches will leave for Bolton Abbey, *viâ* Barden, just before one. On the return, tea will be served at Skipton, and the train for Manchester will leave at 6.20. Given fine weather the day should be a very pleasurable one.

The Manchester Preventative for the Electrolysis of Gas-Pipes.—In regard to the vexed question of electrolytic damage to gas and water pipes in streets served by electric tramways, it will be useful to record the measures taken by Mr. C. H. Wordingham, as the Chief Electrical Engineer to the Corporation of Manchester, to prevent this evil in connection with the electrical working of the Manchester tramways. Particulars of the great undertaking of the conversion of the Manchester tramway system to electric traction have been published in the "Electrician." In formulating his plans for this important work, which involved a large extension of the electricity generating works of the Corporation, Mr. Wordingham found himself in the unprecedented position of having both the electrical and the gas and water interests entrusted to his provident care. In consequence of this, he was able to study the problem of electrolysis by wandering currents from more than the one standpoint of the tramway management. He arrived at the conclusion, from independent study of the question, that the only way to avoid perilous leakage of tramway currents is to feed the tramway system from stations or sub-stations spaced at such short intervals along the lines as will keep down the loss of pressure in the rails to a very low figure. It is hoped that, by never making the distance between the supply stations more than one mile—making half a mile the longest stretch for the rails to act as unrelieved return conductors—the drop of pressure will not exceed from 1 to 1½ volts. This arrangement of frequent sub-stations naturally adds somewhat to the first cost of the system; but if it prevents electrolysis of the street mains, it will be worth in the long run far more than the cost.

ESSAYS AND REVIEWS.

SIR W. RICHMOND ON THE SMOKE NUISANCE.

FOR the pertinacity with which he maintains his crusade against the smoke nuisance, Sir William Richmond deserves the admiration, and also the gratitude, of his fellow citizens. From time to time he endeavours to arouse in the lethargic inhabitants of London sufficient interest in the work carried on by the Coal-Smoke Abatement Society, and sufficient indignation at the poisoning of their atmosphere by breakers of the law against smoke nuisances, to bridge over the wide gap between grumbling and taking action. Sir William, indeed, knows his Londoner too well to imagine that it would ever be possible to get him actually to work in the crusade. The appeals made, therefore, are for the means wherewith to pay others to do the work. It is evidently difficult enough to get the money, though 5s. a year be the whole extent of the appeal; but our surprise is rather that so many than that so few subscriptions are received. To get a Londoner sufficiently interested in any reform affecting London not only to take 5s. out of his pocket, but, further, to go to the post office, buy the postal order, and write and despatch the covering letter, is no mean feat. If Sir William's Society would reprint as a pamphlet his article in the April number of the "Pall Mall Magazine"—not omitting the several striking illustrations*—and would distribute that in the good class residential neighbourhoods, with an intimation that a representative of the Society would call the next day for subscriptions, we believe they would reap a better harvest than they can ever hope to obtain if they leave the Londoner to perform the whole operation of getting the 5s. to the Society's treasury. The Londoner's sympathy might often run to paying the 5s., when it would not stand the bother of sending the subscription. That may sound absurd, but we believe it is the truth; a truth, moreover, that business people and advertisers have to remember, and often profit by remembering.

Those who have charge of, or contemplate undertaking, the advertisement of gas companies' specialities may be advised to bear the hint in mind, that circulars and so forth are all very well so far as they go, but, in order that they shall go the whole distance desired, they must be followed up in such a way that the consumer shall be given the maximum amount of persuasion but the minimum amount of trouble. A well got-up and judiciously worded circular may incline the consumer towards the use of a cooking-stove, or the installation of gas-fires in all his rooms, or in those occasionally used; but the circular is put on one side, and the impression created is, in many cases, not sufficient to carry the reader to the company's office to look at the stoves. Next day, however, let a well-informed, intelligent canvasser call, with fully illustrated catalogues, able to advise as to the kind of fire best suited to each room, and the size of cooker needed by the family, armed with forms of contract ready to clinch the matter, and authorized to quote the cost of fitting up. Then the circular is likely to bear fruit—persuasion has been applied first, and then the necessity to take trouble has been removed. Result, business done. But both stages in the process are essential; they are mutually complementary.

This side-thought has carried us a long way from the initial topic—not so far though, after all, when the close relationship is recalled between the use of gas for fuel, and the prevention of smoke and fog. The man who brings about the replacement of a coal-fire by a gas-fire does a genuine stroke of work towards the abatement of the smoke nuisance. Sir William Richmond should be invited to co-operate with the Gas Companies of London in endeavouring to diminish the output of smoke by increasing the output of gas! His article in the "Pall Mall Magazine" is certainly calculated to interest the public in the subject, but does not go so far as it might into the question of means of prevention. Its object is to show (largely by the aid of photographs) how flagrantly the law is broken by those amenable to it—"factories, steamers, tugs, electric lighting stations, railway-engines, clubs, restaurants, and places of amusement"—and to obtain the money needed for carrying on the work of detection and prosecution. The domestic hearth scarcely figures in the indictment.

In fact, Sir William takes pains to prove that the suggestion "that London fog is *mainly* the result of the open fire in private houses," is not founded in fact. He states that last summer while staying at Lockinge (64 miles from London), on a day when the shade temperature was 93°, and house fires would therefore be a negligible factor, he "walked up to the adjoining downs to breathe fresh air. The wind was then drawing slowly from the south-east, and with it there travelled up dense clouds of smoke, which finally obscured the rolling downs, the trees, and the copses within a small area from my point of observation; and I watched it for an hour travel past me towards the north. The moment that the thick veil reached me and my environment, I smelt that peculiar, stuffy odour of London smoke and dirt. A shepherd told me that he and his friends of the hills called the mist 'London dirt;' and he said that when it passed over the snow in winter time, it left a residuum of black upon it."

Sir William need scarcely have gone to Berkshire for evidence as to the respective parts played by domestic and manufacturing

* Since this article was written, we learn that such a reprint is already in circulation.

fuel in obscuring the London landscape, though his story is a striking proof of the far-reaching influence of smoke pollution. One has only to stand on Parliament Hill at sunrise on (say) a fine Friday morning in the winter, and again on a fine Monday morning, and observe the difference in the view obtainable over London on those two days, to realize that factory smoke has a lot to answer for in the creation of fog and filth.

Sir William's programme is summed up in the one word "Fine." But it seems to us that the labour of his Society will be largely thrown away unless the magistrates can be induced to deal more seriously than hitherto with offenders. It is true that the Act provides that fines can be cumulative—£5 the first conviction, £10 the second, £20 the third, and so on; but can the magistrates be brought to see the necessity of inflicting really material fines upon the offenders? The past record of the Society's work does not seem to suggest that the magistrates have as yet meted out deterrent sentences. The inspectors have registered 2750 offending chimneys; they have reported 1690 to the metropolitan local authorities during the last twenty months; 93 statutory notices have been served upon offenders; and fines to the amount of £715 have been inflicted. What strikes one principally is the disparity between the number of offenders reported and those actually proceeded against; while the fines do not average £10. At this rate, and at a much greater, London will long go smoky.

To those who may first become interested in the subject by Sir William Richmond's well-written article in the "Pall Mall," and to some of those who have followed and sympathized with his crusade of the past few years, it may be surprising to learn that the subject gave rise to agitation long before the sootiness of Hammersmith's atmosphere vexed the soul of the popular Academician, and still more surprising to know that five and thirty years ago London was being held up to the provincial factory towns as an example of how clean a city could be if only it tried! Sir Robert Peel fervently denounced smoke producers, in a speech delivered before Parliament early in 1866; and the writer of a most interesting article in the "Quarterly Review" for April of that year, on "Coal and Smoke"—after showing that the question of the pollution of towns' atmospheres by smoke had occupied the attention of the authorities back in the eighteenth century—is found declaring that "the chimneys of metropolitan furnaces, with only a few exceptions, such as those of the pottery kilns at Lambeth, no longer pollute the atmosphere in anything like the same degree as heretofore, when there was no Act of Parliament in force for the compulsory consumption of smoke!" And yet, in the first year of the twentieth century, the public are being asked for 5s. a year subscriptions in order that, if local authorities and magistrates will permit, the law may be strictly enforced against the smoke producers!

The thought of the premature congratulations of the agitators in 1866 may well give pause to those who anticipate great results from the labours of the Coal-Smoke Abatement Society. With all our heart we wish success to those labours; but we are nevertheless firmly convinced that the steady progress of gas as a heating and cooking agent will do more to lessen the output of coal smoke in one year than all the efforts of the Society will achieve in ten.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 1333.)

Although, as we said last week, gambling in American railways has not much to do with English Gas Affairs, it is impossible to avoid another reference to the subject, for the resulting crisis engrossed attention last week on the Stock Exchange. It was like a tropical hurricane in sudden intensity. Markets not immediately sympathetic have been upset and watched with apprehension, lest the edge of the storm might extend to interests widely apart from the vortex. The amount of destruction dealt around cannot yet be known; but the next settlement will be a trying affair to some. Of course, prices all round, from the most gilt-edged downward, have suffered a squeeze. The Money Market was not as much affected as it might have been; and rates were only a little stiffer, though caution was the order of the day. In the calmer atmosphere of the Gas Market, if peace and contentment did not absolutely reign, there was nice easy-going business devoid of all agitation. A few quotations made moderate and decorous movements—some one way and some the other, presenting a pleasing variety. But none amounted to much; and for some of them it would be difficult to discover the motives. In Gaslight, the ordinary opened steady, and by Thursday, marked top price, and looked as if it was going to advance. But from that point it began to shrink; and the closing figures were 94½. Some moderate transactions took place in the secured issues, of which the maximum improved its position while the preference receded. There was not much doing in South Metropolitan, and the tone was not good—the quotation shrinking a couple of points. Commercials were more active than they had been for weeks, and commanded good steady prices. In the Suburban and Provincial group, business in London was almost at a standstill, and quotations did not vary. Locally, Liverpool "B" had a good rise, while Newcastle debentures receded. In the Continental Companies, European was active and firm, and the rest were quiet and unchanged. Among the remoter undertakings, Oriental part paid was easier, and River Plate debenture rose. Among the Water Companies, the tendency was rather flat generally, and a few quotations had a slight fall.

The daily operations were: Business in Gas was only moderate on Monday, but prices were steady. Gaslight maximum rose ½. In Water, New River fell 2. Tuesday was a quieter day. South Metropolitan fell 1. In Water, Chelsea moved down 2. Wednesday was more active, and some good prices were marked; but Gaslight preference fell 1. Thursday's transactions were more limited. South Metropolitan relapsed 1, and Oriental £4 10s. paid ¼. Friday was steady, and the only move was a rise of 1 in River Plate debentures. In Water, Chelsea preference fell 2. Saturday was quite quiet, and quotations did not move.

ELECTRIC LIGHTING MEMORANDA.

The Electricity Supply of the Borough of St. Marylebone—The Board of Trade Regulations as to Electric Pressure—The Conditions of Change—Transfer of the Consumers' Veto to the Board of Trade.

The electric lighting affairs of the Metropolitan borough of St. Marylebone duly came under the consideration of the House of Commons on the motion for the second reading of the Electric Lighting Provisional Orders (No. 1) Bill, which confirms the two Provisional Orders granted by the Board of Trade to the Borough Council and the Marylebone Electric Supply Company respectively. The Bill was read a second time and committed; and meanwhile the Borough Council have agreed to purchase the local portion of the undertaking of the Metropolitan Electric Supply Company, who were alleging "confiscation" against the Council's measure. This proceeding will be an eminently proper and satisfactory solution of the difficulty, so far as the actual electric lighting interests of the district are concerned; but the case of the new comers remains to be disposed of. That is to say, the Borough Council are still being confronted with the Provisional Order granted by the Board of Trade to the Marylebone Company. The position, therefore, is a curious and remarkable one. If the Borough Council had not entered the field, the competition of the new Company with the Metropolitan Company already in possession would have become effective, in the ordinary course and in conformity with the spirit and the letter of the Electric Lighting Acts. It makes no difference, as regards the law, that the Local Authority steps into the shoes of the Company in possession. Local authorities are no more exempt from the regulated and limited competition favoured by the Electric Lighting Acts than are companies; but, as a matter of fact, there never has been an example of such competition. The question is whether Parliament will create such a precedent in the case of the borough of St. Marylebone.

An important change has been made in the Board of Trade regulations relating to the pressure of electricity supplies, as a result of the recent inquiry into the subject at the Westminster Town Hall. The question arose, as our readers will remember, over the new policy of the Metropolitan Electric Lighting Companies in changing their supply from 100 volts to 200 volts, which occasioned a vast amount of friction between the Companies, their customers, and the Local Authorities. The whole story is an instructive illustration of the kind of trouble that arises when hard-and-fast statutory regulations are brought into conflict with economic influences. There is no doubt that the doubling of electrical pressures is precisely one of those alterations of system, entailing the substitution of one kind of lamp for another, which the framers of the Electric Lighting Act, 1882, had in mind as a likely source of hardship to arise out of the working of what was then an experimental public service. The time came when the suppliers of electricity for lighting perceived that their original pressure of 100 volts at the consumers' terminals could with advantage to themselves in the first place—and therefore in the long run to the benefit of the public—be doubled. All new comers into the business adopted the higher pressure as a matter of course; and the old-established traders in electricity had to do the same, or stand at a heavy disadvantage in comparison with their younger rivals. In these circumstances, the course to be followed could not remain in doubt.

What happened is history. The first of the London Electricity Supply Companies to desire to make the change to higher pressure had to deal with the London County Council, who imposed twelve conditions as the price of their consent. There is an appeal to the Board of Trade in such cases of disagreement between a company and the local authority; and in this instance the Board of Trade, on appeal, suppressed all but one of the proposed conditions. It has been different in the case of a consumer's objection to a change of system which imposes upon him the necessity for change in his lamps. The recalcitrant consumer has been able to exercise an absolute veto on all such proposals; and some consumers have done so. Hence the recent inquiry. It was then ascertained that out of all the customers on the books of the Westminster Electric Supply Corporation, only eight objected to accept a 200-volt supply in place of the 100-volt service they originally contracted to receive. But two or three of the obstinate ones were rather serious customers to deal with—one being His Majesty's Office of Works, in respect of Buckingham Palace, and another the proprietors of the Hotel Windsor, in Victoria Street. It came out that the methods followed by some undertakers in obtaining the consent of their unsuspecting patrons to the change of voltage

were not altogether free from the reproach of being sharp practice; and it was established beyond the possibility of dispute that, wherever the change is effective, the consumer requires more consideration at the undertakers' hands than the latter is always willing to accord to him.

Still, above all these questions of detail, the general principle was established at the inquiry that no statutory regulation, giving an individual consumer an absolute veto over a point of supply economics should bar the way of the development of an undertaking. That would really be an unarguable proposition. Consequently, the regulations of the Board of Trade have now been amended, and have the effect of substituting the discretion of the Board of Trade for that of the consumer. Henceforward, where the consumer withholds his consent to a change of pressure after the local authority have approved of the change, and the undertakers have offered to pay the reasonable cost of, and incidental to, the alteration (including compensation for any loss or damage incurred in consequence of the change), the undertakers may appeal to the Board of Trade; and the consent of the Board will be taken as of the same effect as the consent of the consumer. This seems to be a reasonable way out of the difficulty, and one that will go far to render itself unnecessary. An absolute veto is too dangerous a weapon to be entrusted to everybody.

PRACTICAL GAS-FITTING.

The great Lexicographer who was so fond of taking a walk down Fleet Street is reported to have given utterance, in one of those ponderous phrases which were characteristic of him, to the wish to have every man master of his business. A similar desire has been evinced by many since Dr. Johnson's time; and much has been done in the way of general and technical education, to bring about a realization of the desire. But have we succeeded? Do our handicraftsmen profit as well as they might by the greater facilities afforded them at the present day for becoming really masters of their business; and do they furnish proofs, by their productions, that they have reached the Doctor's ideal? We are afraid that in the majority of cases they do not. "*A l'œuvre on connaît l'artisan*," said the Fabulist. Take gas-fitting. Is the gas-fitter of to-day quite incapable of leaving a disused supply-pipe imperfectly capped, or a chandelier slide in such a faulty condition that it allows sufficient gas to escape to cause the wreck of a house? Some recent cases would appear to require that a negative answer should be given to these questions. But if there is still inefficiency in this particular business, the fault lies with the workman himself, for there have been plenty of people willing to help him to attain perfection. Among the latest comers are the proprietors of "The Plumber and Decorator," who some time ago secured the services of Mr. Walter Grafton, who has achieved such success with his classes on "Gas Manufacture" at the Polytechnic, to write for that publication a series of articles on "Gas-Fitting." Mr. Grafton did not limit himself strictly to the business of laying on gas to houses, but produced a treatise on the distribution of gas in service-pipes, and the best means of using it economically, from the main to the burner. Since the matter first appeared, it has been revised and considerably added to; and it has lately been issued as a book,* in which form it appeals to a wider circle of readers.

Mr. Grafton deals with the various branches of his subjects in 23 chapters, the first three of which are appropriately devoted to the regulations relating to gas-fitting, the tools employed, and the law affecting gas supply. He then initiates his reader into the mysteries of running services from the mains into the houses. Having conveyed the gas inside, he deals with its measurement and utilization for lighting and heating. A useful chapter on the fitting up of workshops follows; and then the author takes up successively public lighting, illuminations, and the lighting of theatres and places of entertainment, shops, schools, and churches. A chapter is devoted to gas-ranges, cooking-stoves, and water-heaters; and the two succeeding ones deal with burners, incandescent gas lighting, chimney-glasses, globes, and reflectors. If gas-fitting is properly executed, there should be no escape; but the author has done well to describe the appliances for detecting any that may accidentally occur. Complaint is frequently made that the use of gas causes vitiation of the atmosphere, and consequent stuffiness; and therefore Mr. Grafton shows how it can be made a means of assisting ventilation. Another cause of complaint is insufficiency of the supply, which frequently arises from inadequate pipes. The gas-fitter, his foreman, or the manager should certainly know how to calculate the sizes of pipes and their delivering capacities; and Mr. Grafton shows him how to do it. The concluding chapters deal with the fitting up of gas and meter testing apparatus, and the lighting of railway carriages and signals.

It will be seen from this epitome of the contents of the book that Mr. Grafton has well covered his ground. He states in his preface that he has endeavoured to treat the subject "purely from a practical standpoint, and to show, in a clear and comprehensive description, the modes of operation adopted in the distribution of gas." On the whole, he has succeeded very well. His text, which is fully illustrated, occupies 315 pages, and there is an index to its subject-matter. Altogether, the book will, we think, merit the attention of those for whom it has been specially prepared.

* "A Handbook of Practical Gas-Fitting, for the Use of Students, Plumbers, Gas-Fitters, and Gas Managers." By Walter Grafton, F.C.S. With 143 illustrations. London: B. T. Batsford; 1901.

PERSONAL.

Mr. John Hall, who has been Chairman of the Chesterfield Gas and Water Board since its formation, has resigned that position.

The students in the Honours Division in "Gas Manufacture" at the Polytechnic, Regent Street, at the close of the course presented to Mr. Walter Grafton, F.C.S., the conductor of the classes, a gold-mounted fountain pen, as a mark of their appreciation of his ability as a teacher.

At the Palace Station works (Norwich) of the British Gaslight Company, Limited, Mr. H. C. Hawke was recently presented by the staff and workmen with a handsome marble timepiece, a pair of bronze figures, a case of silver-mounted pipes, and a match-box, on his retiring after 24 years' service. Mr. John Young, the Manager, in making the presentation, referred in high terms to Mr. Hawke's past services, and, on behalf of the subscribers, expressed the wish that he might have good health and long life to enjoy his well-earned rest. The clock bore the inscription: "Presented to Mr. H. C. Hawke by the staff and workmen of the British Gaslight Company, Limited, Norwich, on his retirement, April, 1901."

OBITUARY.

A melancholy interest attaches to the report of the half-yearly meeting of the Southampton Gas Company on the 1st inst., which appeared in the "Journal" last Tuesday. The proceedings, as we then recorded, were presided over by Mr. R. Chatfield Hankinson, J.P., the Chairman of the Company, who gave an interesting account of the progress of the undertaking. It appears, however, that he was not in his usual health the day of the meeting; and he subsequently went to Bournemouth. No serious development was expected; but on the following Saturday afternoon he was taken suddenly worse, and unexpectedly expired. Mr. Hankinson was a Director of Grant and Maddison's Union Banking Company; his banking career having commenced in Southampton 38 years ago. He was connected with most of the philanthropic institutions in the town and neighbourhood, and was well known for his charitable works. Deceased was in his 78th year, and he leaves a widow and family.

British Association of Water-Works Engineers.—The annual meeting of the Association will be held at Birkenhead from the 9th to the 12th of July. A number of interesting papers will be presented for discussion; and a lecture on "Rainfall" will be delivered by Mr. Plummer, the Astronomer to the Dock Board. Visits are also being arranged to various water-works and other places of interest in the vicinity.

Moorland Waters.—In a recent number of the "Chemical News," notice is taken of the continued researches of Mr. W. Ackroyd on moorland waters; on this occasion with special reference to the source of the combined chlorine. The object of the investigation was to discover the origin of the common salt in the water of the Widdop reservoir in Yorkshire, about midway between the two seas; this water being continually removed, and as continually replenished, from the saltless area of the millstone grit and the Yoredale rocks. The chlorine in the winter rainfall more than accounted for it. The conclusions arrived at are: (1) That the combined chlorine in the reservoir water is wholly derived from rain water; (2) that the quantity of chlorine in the reservoir (the capacity of which is 640⅓ million gallons) closely approximates to a yearly average of 1·188 parts per 100,000; and (3) that in winter the chlorine in the rainfall is in excess of the average for other seasons of the year.

Riche Wood Gas in Spain.—In previous issues of the "Journal," reference has been made to the Riché process of making wood gas. The first important application of the gas has been made, according to the "Revista Minera," at Candas, a town of Oviedo. The plant consists of six retorts, capable of producing from 2648 to 2825 cubic feet of gas per hour. The capacity of the holder is equal to the lower production. The plant is for the purpose of driving gas-engines to produce electricity; but to show the different purposes to which the gas can be put, appliances have been constructed for lighting with Auer burners, ovens for cooking, and a rudimentary stove, built of bricks and asbestos, for heating. The motors are of the Charon type, four in number, each of 10-horse power; and they drive dynamos by the aid of belts. Besides supplying current for lighting the town, there will be sufficient for working, with electro-motors, the saws of a mill, the residue from which is utilized for distillation. As the present work will not be constant, the low unit of 10-horse power was selected, owing to the fact that the best efficiency of gas-engines is obtained when they work regularly. The plant has been installed under favourable circumstances; and wood is very cheap. No figures can be given as to cost price, as the raw material is mere saw-mill waste. On the other hand, the value of the residual charcoal is an important point. In some places it would pay for the cost of the wood.

COMMUNICATED ARTICLE.

THE NEW COAL TAX.

By "Free Trader."

It is distinctly amusing to find the writer of the Editorial on "The Export Duty on Coal" in the "Journal" for May 7, in one paragraph eulogizing with a lineful of adjectives the great and historical speech of the Chancellor of the Exchequer, and in another sneering at one who has the temerity, in these days of ignorant impatience with scientific economics, to call himself a Free Trader. Amusing because the Chancellor, in the course of that very same great, historical, &c., speech, actually dubbed *himself* a Free Trader, and did not even apologize for so doing. Certainly, I am not ashamed of belonging to a school which has included every Chancellor of the Exchequer since the time of Sir Robert Peel.

I am told that I must deal with Professor Marshall (whose letter in "The Times" of April 22 had not been overlooked by me). The writer says: "It seems to be the rooted conviction of economists of his [meaning, I suppose, of my] order, that the British consumer pays all duties that are required to defray the national expenses." Even if, as the sentence might be interpreted, the "his" referred to Professor Marshall, it would not be wide of the mark; for, in his letter to "The Times," the Professor said: "The main burden of such taxes is borne by the country herself; but other countries are forced to contribute *a small share*." Yet the Chancellor and the "Journal" flatter themselves that we are going to get the whole £2,100,000 a year out of the foreigner!

And really is Professor Marshall the sole buttress of the good people who are so anxious to shift the burden of their patriotism on to the shoulders of their neighbours? If so, it is not a very firm one. His approval of an export duty on coal runs to this: "There are thus three classes of frontier taxes which *may be* [not "which are"] economically defensible. . . . The third are special export duties on commodities with which foreigners cannot easily dispense. Such *seems* to be the case with our *best* steam coal, and, *perhaps*, our *best* gas coal." It is evident that Professor Marshall is of opinion that only that portion of our coal exports that consists of best steam coal (much of which, by the way, is sent abroad for the use of British merchant vessels and the British Navy!), and "perhaps" of best gas coal, occupies a different economic position from other exportable commodities. He makes this quite clear in his second letter, published in "The Times" of the 9th inst., in which he says: "The share of the tax which will now be shifted on to the foreigner depends, at least so far as exports to the North of Europe are concerned, largely on the question how far our coal is needed for purposes for which ordinary coal is inadequate." All this pretty considerably discounts Professor Marshall's initial declaration, that an export duty on coal is not to be condemned on general economic principles—the word "coal" being eventually, in effect, reduced to "such of our coal as the foreigner cannot do without."

Finally, as to the throwing of Professor Marshall in my face, I would say that, if we are to make it a matter of professors' opinions instead of our own, I can retaliate with two—Fawcett (who, even after he had "modified his position somewhat," thought an export duty on coal bad economy) and Jevons (who, besides being a professor of political economy, knew more of the practical aspects of commerce, and especially of the coal trade, than any of his contemporaries). I would recommend anyone who wants his ideas upon the subject clarified, to obtain Jevons's book, "The Coal Question," and study the chapter entitled "Of the Export of Coal." In it, he remarks that: "Our foreign coal trade has been, and is, and will be, an integral and essential part of our system. It is the *alpha* and *omega* of our trade. . . . To prohibit this trade, would be to incur a burden equal to the income-tax at its worst. [This was written subsequently to a sixteenpenny income-tax.] And though the greater part of this burden would be borne by the community in general as the consumers of foreign produce, it would be inflicted through that branch of our industry—our navigation—which is truly the safety and glory of England. . . . Coal is to us the one great raw material which balances the whole mass of the other raw materials we import, and which we pay for either by coal in its crude form, or by manufactures which represent a greater or less quantity of coal consumed in the steam-engine or the smelting furnace."

Oh! but, we are told by the Chancellor and others, a shilling a ton will not check our exports of coal. Even were that so, which I do not believe, what is there sacred about the one shilling? If, as the writer of the Editorial in question would appear to think, a tax on coal is the last resource of the nation (it is no time to inquire too nicely as to whether the tax be based on sound or false principles, be wise or foolish as a policy—"the country needs revenue," that appears to be the line to take), then supposing, as is most probable, still more revenue is needed next year, shall we not have to make the tax five or ten shillings? If it be said that such a tax would defeat its own object by diminishing the exports of coal, is it not obvious that a one shilling duty tends in the same direction?

Look at it this way: Assuming, for argument's sake, that the foreigner pays the whole duty, and never gets any of it back through other channels. Gas is now almost everywhere dearer in consequence of a seven or eight shilling rise in coal. It is admitted by everyone that the consumption of gas has been considerably diminished, or the rate of increase has been greatly checked, by the dearness. Does it not stand to reason that any rise in the cost of coal—say, a shilling a ton (uncompensated by any addition to the price of coke), equal to over a penny per 1000 cubic feet—would, in its measure, be a check upon the increase of the gas-selling business? Demand, even for that of which the seller has a monopoly, is always more or less affected by price.

Then, if the foreigner has the cost of his coal raised a shilling a ton, he will not be able to afford to buy as much as he otherwise would have done. Bearing in mind the quantity of second-quality coal included in the 44 million tons exported last year, it is certainly not an extravagant estimate to put the ultimate annual reduction consequent on the imposition of the shilling duty at 4 million tons. I say "ultimate reduction," because contracts already concluded will prevent the full effect of the duty being shown this year. And every ton of coal prevented by taxation from being mined and exported, represents a loss of income to the nation of its delivered price—say, at least ten shillings. So that if the shilling tax reduces our exports from 44 to 40 million tons, we shall not add a penny to our total receipts. We shall receive 40 millions × (10 + 1)s. instead of 44 millions × 10s., and shall have incurred the expense of collecting the shilling duty! It is true we shall have 4 million tons more of coal left in stock, *but that will not be earning a penny piece*. So the net result will have been to set aside the equivalent of 2 millions of money, at no interest, for the problematical benefit of posterity (say) 300 years hence. And all this is assuming that the foreigner is unable to get any part of the 2 millions of duty back from us. If he is able to recover any portion of it, our actual cash receipts will be to that extent less than before the duty was imposed. If he is able to recover it all, we shall, in effect, have taken 2 millions of interest-earning capital, and buried it in the ground! To have used it to diminish the National Debt, would have been to reduce our annual expenditure by £50,000.

Professor Marshall speaks of selling coal to foreigners as "wasting our children's inheritance;" but it all depends on what we do with the proceeds. Which would you rather your father did with the money he intends to bequeath to you—bury it in the ground, or put it out at 2½ per cent. compound interest? Even, indeed, if he spent the interest in a totally unproductive fashion, you would certainly be none the worse off than if he buried the money. Where you would lose would be if he spent the capital. What, therefore, would be the ideal course to adopt in regard to our coal resources is that which Gladstone and Mill always favoured. Calculate the quantity and value of our total coal stock, and its probable duration. Then set aside at interest a sufficient sum per annum to provide, by the time the stock is exhausted, a fund equal to its "present value." But there is one obvious practical objection to this plan—and that is that it is impossible to say what the present value and probable duration of our coal stock are, because we cannot read the future. If scientists to-morrow should discover how to make 1 ton of coal do the work now got out of 3 tons, the life of our coal-fields would be greatly increased; and such an event is not beyond the range of probability. It is, moreover, obvious, from the vast accumulation of capital that has been witnessed in this country during the past half-century, that we have not been spending unproductively all the proceeds of our coal-mining labours.

The Chancellor of the Exchequer mentioned in his speech that, in the past 30 years, we have exported 960 million tons of coal; and he seemed, if anything, to regret the fact. What, however, would be the financial position of this country to-day, what its place in the commercial world, if, instead of having turned 960 million tons of coal into, say, 500 millions sterling, and having had the use of an increasing proportion of that realized wealth in each of these 30 years, the 960 million tons of coal were at this moment in the earth beneath us, waiting to stave off, at the end of several centuries, the exhaustion of our coal-beds for from three to four years?

Turning to the debate in the House of Commons on the duty, one or two points are worth noticing. One is that, while the majority were obviously largely animated by a desire to "take it out" of the coalowners, who made such a good thing out of the "boom" last year, no one of those members proposed that the originators of the "boom" should be singled out for special taxation. I mean the iron and steel makers, who made large fortunes before the price of coal hashed-up their business. The reason is evidently that iron prices have already come down; and everyone knows that the manufacturers will have a bad time in the near future. Yet they made splendid profits in 1898, 1899, and 1900; and the coal trade has got just as bad a time in front of it, only people refuse to take that fact into account.

Another point is this: The Chancellor, and others, refuse to see that the reason the foreigner would pay the higher price for his coals last year was the *general* failure of supply to equal demand. He and they ignored the fact that there were coal crises in Russia, in Austria, in Germany, and in France, in spite of the increased quantity of coal (6½ million tons) exported from this country in 1899, and the further increase of 3 million tons last year. They ignored the strike of Austrian miners in January to March, 1900, which curtailed the supply of coal in Europe by 5 million tons; they ignored the fact that the 100 million tons of coal raised in Germany fetched correspondingly high prices to English coal, because the iron trades were as busy in Germany, France, and Belgium as here; they ignored the fact that many towns on the

Continent had to burn wood instead of coal, and to shut up factories; they ignored the fact that, owing to the great expansion of the iron trade in Russia, coal was so scarce that the import duties were suspended, and penalties inflicted on coal merchants for charging exorbitant prices—they ignored all this, and that trade is now as slack on the Continent as it was brisk, and then argued that the foreigner would pay any price we liked to ask *at any time!* That was as absurd as Sir William Harcourt's failure to understand that, even if we had an absolute monopoly of the Continental coal trade, the competition of one English merchant with another would keep down prices in normal times, and that a tax imposed on all coal exported could (had we the monopoly) be extorted in the first instance from the foreign buyer, in addition to the price fixed by the higgling of the market, though he might recover it from us in the end.

Absurd, also, was the argument of supporters of the tax—that, since English coal still holds the market in many places in spite of import duties imposed by the purchasing country, therefore an export duty would not affect its chances of keeping those markets. The import duties fall upon all coal from whatever country arriving. There is not therefore any disadvantage placed on the competing coal exporters. But to put an export duty on English coal is to handicap that coal, and that only, in the competition.

However, the tax is now certain to be carried, and the Chancellor has announced that it is intended to be permanent. For the present, therefore, argument avails little. It must be left to time to show the ultimate bearing of the tax upon the nation's prosperity. That its imposition will prove to have been a serious blunder, I have not the slightest doubt. But then, you see, I am a Free Trader.

TECHNICAL RECORD.

GERMAN ASSOCIATION OF GAS AND WATER ENGINEERS.

Programme of the Annual Meeting.

The programme for the Forty-first Annual General Meeting of this Association, which has been fixed (as already announced) for June 16 to 20, has now been issued. The members and visitors will assemble at Vienna on Sunday, June 16, when an evening reception and concert will take place under the auspices of the Local Committee. The following day, from 9 a.m. to about 3 p.m. will be devoted to the reading and discussion of communications dealing with lighting, and Tuesday, the 18th, to papers on water supply. The next day will be given to the business of the Association, reports of Committees, &c., and any matters left over from the preceding days. Special entertainments and excursions (including visits to the new municipal gas-works and the water-works) have been arranged for the afternoons and evenings of these days; while Thursday, June 20, will be devoted to an excursion to the Kahlenberg and Leopoldsberg. Some whole-day excursions to more distant places are also contemplated if the weather is favourable, and a special programme has been drawn up for ladies on the days devoted to technical matters. The Association and the Local Committee will heartily welcome all visitors interested in the gas and water industries; but applications for tickets, &c., should be made by the 20th inst. at latest.

A special exhibition of plans, models, schemes, and objects which do not require any particular preparations for their proper display, will be held at the Musical Society's rooms, in the concert hall of which the meetings will take place. Exhibits intended to be shown here should be sent to Herr W. Kefer, Erlachgasse 117, Vienna X., by the 1st prox. There will also be held at the rooms of the Imperial Horticultural Society in Vienna from May 25 to June 25 a general gas and water trades exhibition. Intending exhibitors should communicate with Herr Hartberger, Weihburggasse 14, Vienna I.

The following is a list of the more important communications which will be presented at the meeting after the delivery of the Inaugural Address by the President, Herr E. Beer, the Manager of the Municipal Water-Works of Berlin: "The Construction of the Municipal Gas-Works at Vienna," by Herr Kapaun, the Managing Engineer of the works. "Starting Work at the Municipal Central Gas-Works at Vienna," by Herr G. Wobbe, Superintendent of the works. A lecture, the subject matter of which is not announced, by Dr. Carl Auer von Welsbach, of Vienna. "The Differential Gas-Rate Question," by Herr W. von Oechelhaeuser, of Dessau. "Explosive Gaseous Mixtures," by Dr. H. Bunte, of Carlsruhe. "Rapid Measurement and Analysis of Gas," by Dr. H. Strache, of Vienna. "The Water Supply of Vienna and the Construction of a Second Deep-Well Supply for the City," by Herr Berger, the Managing Constructing Engineer. "Scheme for the Supply of Prague with Well Water," by Herr O. Smreker, Engineer, of Mannheim. "The Water Supply of Some North Sea Baths," by Herr Herzberg, of Berlin. "The Purification of Water by Combined Coarse and Fine Filters," by Herr H. Peter, Manager of the Zürich Water-Works. "Underground Water Containing Iron, and the Construction of Installations for the Removal of the Iron," by Herr E. Prinz, of Berlin. Afterwards, the reports of the Committees appointed by the Association to investigate the subjects enumerated below will be presented by the persons named: "Photometry," by Dr. H. Krüss, of Hamburg. "Heating," by Professor Junkers, of Aix-la-Chapelle. "Gas-Meters," by Herr C. Kohn, of Frankfort-on-Maine. "Gasholders," by Herr Niemann, of Dessau. "Water Statistics," by Herr Joly, of Cologne. "Water-Meters," by Herr W. H. Lindley, of Frankfort-on-Maine. "Regulations for Preventing Injury to Gas and Water Mains by Tramway Currents," and "Instruction," by Herr W. von Oechelhaeuser, of Dessau.

WATER GAS AND OTHER COMBUSTIBLE GASES.

By Herr Joh. Körting, of Hanover.

[Abstract Translation of a Communication to the Association of German Engineers.]

(*Continued from p. 1224.*)

Dr. Strache's Water-Gas Process.

Dr. Strache has contrived a means of rendering bituminous coal available for the production of water gas without loss of the hydrocarbons which it yields. His generator comprises two parts, in the lower of which is coke, and in the upper coal, or a mixture of coal and coke. The heat of the coke in the lower part is first of all raised by means of air previously well heated in air-heaters. The producer gas thus formed passes through an opening at the top of the part of the generator which contains coke, to a regenerating chamber, where it is burnt by means of a supply of air. As soon as the layer of coke has been raised to incandescence, the outlet for the producer gas is closed; an outlet above the layer of coal is opened; and the producer gas is passed through it to the regenerating chamber. Gas making is then started, with a reversal of the direction of the gases, whereupon the products of the distillation of the coal go to increase the volume of water gas. The surplus water gas is taken off by means of a pipe at the base of the generator, while a circulation of gas through the apparatus is kept up.

It is not clear to what extent a good return is obtained from the bituminous constituents of the coal. Dr. Strache gives, as the most recent results of working his generators, a yield of 32 to 40 cubic feet of water gas per pound of gas coke, and of 25½ to 32 cubic feet per pound of good coal consumed. These results would appear to show that it would only be economical to employ coal in place of coke when coke was fully 25 per cent. dearer than coal. The plant for consuming coal is, moreover, of more expensive construction than that for coke only.

The results of trials of Dr. Strache's plant at the gas-works at Pettau, in Bohemia, have recently been published. The coke used had a calorific power of 3365 calories per pound; Upper Silesian coal used, a value of 2887 calories; and Buchberg lignite, 1936 calories. These three fuels yielded respectively 37·16, 27·87, and 15·38 cubic feet of water gas per pound of fuel consumed. Assuming that the water gas had an average calorific value of 70¾ calories per cubic foot, the efficiency, or relative utilization of the fuel in the generator, would correspond to 78, 69, and 52 per cent. for the three types of fuel. But if the gas had a value of only 65⅛ calories per cubic foot—which appears, from some communications, to be more probable than the above—then the efficiency would amount to only 72, 63, and 47·5 per cent. for the three different fuels. Taking account of the boiler-fuel also, on the assumption that 62·5 lbs. of steam will be used per 1000 cubic feet of gas made, and that the three types of fuel have evaporative powers of 8, 7, and 4½ respectively, the efficiency, or relative utilization of the fuel, inclusive of the boilers, will correspond to 60, 58, and 42 per cent., if the gas has a calorific value of 70¾ calories per cubic foot; or to 56, 50, and 39 per cent. for the three types, if the gas has a value of only 65⅛ calories per cubic foot.

The actual working results at Pettau, using Krapina (Croatia) lignite and Wöllan (Styria) coke, have also been made known. The Wöllan coke yielded a bad clinker, and was subsequently displaced by gas coke. Analyses and determinations of calorific power are wanting for all these fuels; but the Krapina lignite is said to be much inferior to Prussian coal, and the coke is also stated to be of indifferent quality. Under the circumstances, it seems fair to give the lignite the same calorific power as Buchberg lignite—*i.e.*, 1936 calories—and the coke a value of 2948 calories per pound. From June 1 to June 15, 1899, there were made, on the average, 9780 cubic feet of gas per diem from 604 lbs. of the lignite and 170 lbs. of Wöllan coke; while the consumption of lignite for the boiler is stated at 110 lbs. This latter quantity had evidently merely been estimated. For getting up the heat in the generator, 128 lbs. of coke were employed. Omitting the latter, but including the lignite used both in the generator and boiler, and the 170 lbs. of coke, the heating value of the fuel consumed would amount, in round numbers, to 2,000,000 calories. The 9780 cubic feet of gas, taken at 70¾ calories per cubic foot, would have a heating value of about 692,000 calories; hence the efficiency of the process is about 35 per cent. The cost of the water gas made by this process likewise cannot be given with precision. If, however, the fuels are assumed to be obtainable at prices proportional to their calorific values, then, at the rates already adopted for standard fuels, the cost of the 9780 cubic feet of water gas

would be nearly 5s. 1d.; and hence 1000 cubic feet would cost barely 6¼d. The cost of 1000 calories by means of this gas would be 0·086d.

Other results from a works' installation using Silesian coal are as follows: From 521 lbs. of the coal, 9275 cubic feet of gas were obtained; 44 lbs. of coal were also used for raising steam (this quantity appears to have been estimated, and at a low figure); while 67 lbs. were used in producing gas for the gas-engine which drove the fan for the blast. Therefore, 632 lbs. of coal were consumed in all, which is equivalent to a consumption of 68¼ lbs. per 1000 cubic feet of gas made. Assuming that the coal had a calorific power of 3400 calories per pound, and the water gas a value of 70¾ calories per cubic foot, then the efficiency, or relative utilization of the fuel consumed, would be 30·5 per cent.; and the cost of 1000 cubic feet of the water gas would be a little over 6¼d. At this figure, 1000 calories would cost 0·089d.

These results are considerably less favourable than those of the trial runs, which, however, were made with apparatus of later construction. On the other hand, greater care would be bestowed on the trials than would be possible in regular work. It is, however, to be expected that the newer apparatus would give better practical results also. The producer gas could be employed in this process, just as in that of Humphreys and Glasgow, for carburetting the gas with oil; but there are no particulars available as to the changes of detail which would be involved.

In the cases considered so far, no account has been taken of the cost of lighting up the generator, which naturally varies greatly. It is necessary also to distinguish between the lighting up of a generator when it is first being put to work, and the cost of raising the heats with a generator which is worked every day, after an interval between the periods of working. Some particulars are available as to the cost of raising the heats in the Humphreys and Glasgow plant at Bremen. After standing down for sixteen hours, the raising of the heat of the carburettor and superheater entailed a consumption of about 705 lbs. of coke. As the plant has a productive capacity of 28,000 cubic feet per hour, the loss of coke in raising the heats amounts to 3·1 lbs. per 1000 cubic feet of gas made. The water-gas plant at Königsberg showed, however, that 6·5 lbs. of fuel were used (merely in raising the heats) per 1000 cubic feet of gas made. The Pettau plant is reported, under the conditions already stated, to consume 13 lbs. of coke in raising the heats per 1000 cubic feet of gas produced; while the second trial run of Dr. Strache's plant showed a consumption of coke for the same purpose of 12½ lbs.

Adding to these amounts the great quantities of fuel which must be consumed in the course of a year in lighting up the generator, it must be granted that these losses considerably alter the aspect of the process. As the possibility of interrupting gas making at will is put forward as an advantage of the water-gas process, such losses have actually to be reckoned with. A mean value for them may be assumed; and probably 6¼ lbs. is as low as may be safely taken. This figure has been adopted in order to make a fair comparison with the cost of working in coal-gas works, in which all such losses are included. It is necessary besides, when the lighting of towns is considered, to have regard to the cost of imparting an odour to the simple water gas. Taking carbylamine as costing 1s. 4d. per lb., the cost of odorizing the gas by means of it will be a little over 0·8d. per 1000 cubic feet. The values computed from these figures will be brought together in a table which will be given later. Before this is done, it is desirable to consider other descriptions of gas which may compete with water gas.

Coal Gas.

The average values used below have been arrived at from the statistics relating to more than 200 large and small gas-works. The results from many bad and old works are included, and in these cases the adoption of modern improvements would show a great alteration for the better. Also large works generally would show far better results than the mean values here adopted.

A ton of gas coal, having an average calorific power of 3538 calories per pound, yields 10,400 cubic feet of gas, having a calorific power of 141½ calories per cubic foot. It also yields 46·5 per cent. of its weight of coke, having a calorific power of 3175 calories per pound, in addition to the coke which is consumed in the retort-furnaces. Other products are 0·6 per cent. by weight of ammonia, which has no heating value, and 5·3 per cent. of tar, which has a calorific power of 3945 calories per pound.

The heat utilized may then be calculated for two different cases. Firstly, if the coal gas is regarded as the sole object of the process, the relative utilization of heat is as follows: 1000 cubic feet of the gas have a calorific value of 141,600 calories, and are obtained from coal having a calorific value of 761,600 calories, from which there is to be deducted the calorific value of the coke and tar recovered—viz., 363,200 calories. This leaves 398,400 calories as the net value of the coal used in producing the 141,600 calories found in the gas. Hence the efficiency, or relative utilization of heat in the process, is 35·5 per cent. In the second case, if the coke and tar as well as the gas are regarded as the ultimate objects of the process, then the calculation is as follows: The 761,600 calories of the coal yield 141,600 calories in the gas and 363,200 calories in the coke and tar. This makes a total yield of 504,800 calories, which gives the efficiency of the process as equal to 66 per cent. Hence 66 per cent. of the heating value of the coal is recovered.

In computing the cost of the gas, it is immaterial which of the two modes of calculation is followed. Taking the cost of coal at 18s. 3d. per ton, and the value of coke, tar, and ammonia at the figures already adopted (*ante*, p. 1223), the net cost of 1000 cubic feet of coal gas works out at 6·44d. Hence the cost of 1000 calories, from coal gas, is 0·046d. These figures cover all losses of fuel in the starting of settings, slow fires, &c.; and therefore, as already pointed out, they differ from those given for water-gas installations. Since, at the present time, the coke produced by the coal-gas plant is often used for the manufacture of water gas, which is then mixed with the coal gas, it will be worth while to consider the question of the production of this mixed gas.

The coal produces 46·5 per cent. of its weight of available coke. Now the Humphreys and Glasgow plant requires 38·7 lbs. of coke per 1000 cubic feet of water gas made (*ante*, p. 1223); and to this must be added 6¼ lbs. for the fuel used in getting up the heats, &c.—making in all about 45 lbs. per 1000 cubic feet. Hence it will be found that the available coke from a ton of coal will yield 23,180 cubic feet of water gas. Hence a ton of coal will yield, in all, 10,400 + 23,180 = 33,580 cubic feet of gas, of which the calorific value will be—

$$\frac{10{,}400 \times 141{\cdot}6 + 23{,}180 \times 70{\cdot}79}{33{,}580} = 92{\cdot}7 \text{ calories per cubic foot.}$$

From these figures it appears that a ton of coal, costing 18s. 3d., from which must be deducted the value of the tar and ammonia recovered, equal to about 3s. 3d. (making the net cost 15s.), will yield 33,580 cubic feet of gas of an average calorific value of 92·7 calories per cubic foot. The cost of this gas will, therefore, be: 5·36d. per 1000 cubic feet; and the cost of 1000 calories obtained from it will be about 0·058d.

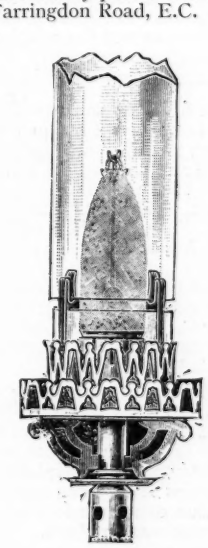
It will be seen, therefore, that this method of utilizing the coke produced by a coal-gas plant is not advantageous at the prices adopted here. It will only become profitable when, owing to there being no (or very little) demand for coke, the price obtainable for it falls off very greatly. Under such conditions, it would become economical to use the coke produced by the coal-gas plant for the manufacture of water gas.

(*To be continued.*)

THE AIR SUPPLY TO INCANDESCENT BURNERS.

Of novelties which have for their object the improvement of the light-giving power of incandescent lights, we have had many examples from time to time in the "JOURNAL;" and at these novelties—judging from the information received from manufacturers as to sales to retailers—the public jump when they are brought to their notice. But novelty and usefulness do not always go hand in hand; and when the public find that something they have been cajoled into buying has no really good effect on their incandescent mantles, the result is not always beneficial to the gas suppliers, who perhaps have had no part in recommending the unfortunate appendage. The gas consumer, as a rule, does not like to think he has been had; and then, as he has only one alternative, the censure which should be cast on the worthless novelty falls upon the gas supply, which (so he informs his friends) must be bad. If, however, the purchase should prove successful, then the gas consumer is satisfied; and the gas supplier reaps a more or less direct benefit.

So far as we know, the latest thing in the way of a novelty is a little fitting for ordinary incandescent burners which has been successfully put on to the market by Messrs. J. & W. B. Smith, of Farringdon Road, E.C. It is called the "Climax" incandescent light intensifier; and it raises a point which should be definitely settled. Ever since the old pear-shaped bulbs came out, with three or four holes in the sides for the admission of air to support combustion, it has been a debatable question as to whether any actual benefit is obtained by the lateral air supply as compared with the ordinary ascending supply from the bottom of the chimney. We do not remember ever seeing any reliable photometrical tests on the point; and it would be interesting if someone would now make a series of tests to see what really, if any, is the advantage gained by the one method of air supply over the other. If any benefit is secured by the lateral air supply, then the sooner the manufacturers of burners make them with a solid plate chimney gallery, and supply chimneys with openings in the side for the air-supply, the better. But as they are not doing so at present, we return to the "Climax" intensifier.



The name given to this little fitting suggests something of a mechanical nature; but it is nothing of the kind. It is merely an improved means of obtaining the lateral air supply; and the whole arrangement can be obtained for a few pence. It consists of a brass collar which is pushed (by removing the cap of the burner) well down into the bed of the chimney holder, and this prevents the ascending supply of air to the burner and mantle. On the

collar are provided three upright supports, about 2½ inches in height, for carrying an ordinary 6-inch chimney. Within the supports and surrounding the burner is a small glass cylinder about 2 inches in height, and of slightly smaller diameter than the chimney above. Therefore between the top of the little cylinder and the bottom of the chimney is a continuous open space about ⅜-inch in depth; and so in this way there is practically an unbroken lateral air supply all round the mantle. Messrs. Smith claim that it is in the uniformity of the air supply in this particular position that they secure a greater intensity of light from the mantle, both in comparison with the ordinary chimney and the perforated bulb. Regarding the latter, they advance the suggestion, and it seems a feasible one, that the rushes of air from three or four opposing points cannot conduce to an even distribution of air to the flame and mantle, and must consequently act detrimentally on both. Be that as it may, the "intensifier" is credited with producing an increase of 40 per cent. in the light-giving power of a mantle. We cannot bind ourselves to percentages; but we can speak to the fact that, after fitting an ordinary "C" burner with the little device under our own control, the light appeared to be more intense, and for nearly the whole of the way up the mantle (which, it should be said, had previously been in use for about two months) the incandescence was perfect. At the same time, we should like to have the question as to the proper position for the air supply to the burner proved by the photometrical tests of an independent person.

A NEW INCANDESCENT STREET-LAMP LIGHTER.

A new igniting device for attachment to incandescent street-lamps is to be seen at Messrs. H. Greene and Sons, Limited, of No. 19, Farringdon Road. Its chief merits are that it is simple, that it is rapid in action, that an ordinary torch may be used, that the torch is not brought nearer the mantle than the frog of the lantern, and that consequently no flap-door is required in the bottom of the latter for lighting purposes. On the supply-pipe just beneath the burner-cock is inserted a plug cock, from which issues the gas for the supply of the lighting arrangement. The opening and closing of this plug cock is controlled by a weighted lever, above which a spring is also provided to ensure the rapid shutting off of the gas supply on the ignition of the lamp being completed. The weighted end of the lever is enclosed in a cylindrical casing, with its bottom end open, and which casing is affixed to the frog of the lantern. At the top of the cylinder, and connected with the plug cock, is a small coil of copper tubing containing a row of perforations, and this perforated tubing is continued up within the lantern to a slightly higher level than the top of the mantle or mantles. Now assuming the tap supplying the burner has been turned on, the insertion of the lamp-lighter's torch in the cylindrical casing lifts the weighted lever, and gas is simultaneously admitted to the coil, and is at once ignited. With a run the small jets of gas issuing from the perforated tube within the lantern also ignite, ending with a jet at the top which shoots an arm of flame over the mantle. On the withdrawal of the torch, the weighted lever drops, and closes the gas supply to the lighter. The whole action takes no longer than is required to push the torch up to the top of the cylindrical casing and to withdraw it. In lanterns containing more than one mantle the copper tubing is carried up between them; and in the case of widely-spaced clusters small branches are carried out from the tube to within a short distance of the tops of the mantles. The igniter has been adopted at St. Albans, and elsewhere.

Annual Meeting of the Association of Dutch Gas Engineers.—The twenty-ninth general meeting of this Association will be held at the Hague on Wednesday and Thursday, the 26th and 27th of June, in the rooms of the Royal Zoological and Botanical Society. The reports of the Technical Committees of the Association will be received; and 24 questions on matters of interest in the gas industry are to be raised for discussion. The President of the Association is Heer D. van der Horst, of Amsterdam. The gas-works at the Hague will be visited in the course of the meeting. The official organ of the Association, "Het Gas" (which is issued monthly), has this year been considerably enlarged and improved. It is under the joint editorship of Heer C. T. Salomons, of the Municipal Gas and Electricity Works of Rotterdam, and Heer P. Bolsius, of the Municipal Gas-Works at 's Hertogenbosch.

Waste in Blast-Furnace Operations.—At the annual meeting of the Iron and Steel Institute last week, the President (Mr. W. Whitwell), in his address, referred to the waste which occurs in blast-furnace operations through the loss of heat in the iron and the slag. The heat lost in 100 tons of pig iron was equivalent to 4·125 tons of coal; while that lost in 150 tons of slag was equivalent to 10·3 tons. At 10s. per ton, the value of the waste heat in the iron and slag of the Cleveland district was £138,070. The President pointed out that another item of waste was blast-furnace gases, though of late their value for use in gas-engines had, he said, been recognized, and in some instances they had been adopted for this purpose. He then summarized the waste going on in the blast-furnaces of the Cleveland district as follows: Horse power in the gases, 61,000; waste heat in the iron and slag, equal to 276,140 tons of coal, or 31,500-horse power; total going to waste, 92,500-horse power.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

Mr. Young's 6·4d.

SIR,—In reply to Mr. George Helps's letter in the "JOURNAL" for the 30th ult., it must, of course, be understood that gas must be sold at a profit. Gas does not differ in this respect from any other manufactured article. It must be sold at a profit to make it pay. In the case stated, Mr. Helps has only to go on increasing the quantity sold at less than cost price until it reaches 100 per cent., to change his profit into a deficit. I have endeavoured to show, however, that as the quantity of gas sold increases, so the profit per 1000 cubic feet necessary to pay dividend decreases. The cost of manufacture in each case consisted of the items: "Purifying materials and wages," "Oil, water, and sundries at works," "Salaries of engineers and officers at works," "Wages and gratuities at works," and "Repair and maintenance of works and plant (including renewal of retorts), machines, apparatus, tools, materials, and labour."

Mr. Helps asks what I would expect if I retained my 5733 ordinary consumers and increased the number of slot consumers to 12,388. If the slot consumers maintained the present average consumption per meter and the ordinary consumers remained stationary, I should expect an increase of 130 million cubic feet per annum, and a corresponding decrease in the cost of standing charges per 1000 cubic feet, since rates and taxes, Directors' allowances, salaries of Secretary, clerks, and collectors, and general establishment charges, would be practically the same in both cases.

Norwich, May 10, 1901. JOHN YOUNG.

The Amalgamation Question.

SIR,—In the hope that it may contribute in a small way to the solution of the existing difficulties in the way of the amalgamation of the two gas engineering Societies, the following addition to the rules is suggested for the consideration of the respective Councils:—

Provided that any member of the Gas Institute or of the Institution of Gas Engineers who would, at the time of his election to either society, have been qualified for admission to the [*proposed new society*], or who may have any of the following qualifications—viz., M.Inst.C.E., Assoc.M.Inst.C.E., M.I.Mech.E., Assoc.I.Mech.E. (?), F.I.C., F.C.S.—shall be considered eligible for admission to the [*proposed new society*], and shall be admitted accordingly. The qualifications of all such members shall be submitted to the first Council of the [*proposed new society*], and determined by the majority of such Council (voting in the manner prescribed by the rules), whose decision shall be final.

May 11, 1901. A COUNTRYMAN.

PARLIAMENTARY INTELLIGENCE.

GLEANINGS FROM THE COMMITTEE ROOMS.

Progress. The list of Gas Bills appearing as opposed measures continue to dwindle; and several more were passed on last week for third reading. Among them was the Bill of the British Gaslight Company, who have had some little difficulty in satisfying the Hull Corporation; but the relations between the two bodies have been so amicable in the past, that it would indeed have been regrettable if that friendly feeling had been disturbed by a struggle in the Committee rooms over points which, so far as we have ascertained, were not really of such great moment to the Corporation as they were to the Company. The latter have supplied cheap gas to the consumers in the past; and they are supplying the Corporation in bulk at 1s. 6d. per 1000 cubic feet. This sufficiently indicates that there can be little to complain about; and the manner in which the Company have fulfilled their duty hitherto gives the Corporation and consumers an assurance that any dereliction is unlikely in the future. Another Bill that has gone through is that of the Poulton-le-Fylde District Council, to authorize the purchase of the gas-works. This measure merely consummates a clause in the Company's Provisional Order of 1888, providing that, if within fourteen years the township should be constituted a local government district, the authority should have the right to acquire the undertaking. The Council asked to be granted 45 years as the period in which to repay the necessary loan; but Lord Morley has declined to accede to more than 40 years. The Omagh Gas Bill is now to pursue its passage without further hindrance—the opponents, after causing a little obstruction in the House of Commons, having come to an agreement with the promoters. The opposition to the Mond Gas Bill held Colonel Welby's Committee closely from the time they reassembled on Tuesday until yesterday, when their decision (as recorded elsewhere) was given. Sir Henry Fletcher's Committee set to work on Thursday with the South Metropolitan Bill. The section referring to the purchase of the Nine Elms works created a little tangle; and an adjournment was made at midday on Friday to permit, if possible, of its unravelling. The decision on this Bill was also announced yesterday; and is given later on in these notes. The Golborne Gas Bill has engaged a Committee presided over by Mr. Caine, whose genial air contributed to this intricate case proceeding pleasantly. Portions of the Leeds (General Powers) Bill, including the section referring to the Corporation Gas Department, passed Lord Dartrey's Committee; but the heads of the Bradford Corporation Gas Department (among whom Mr. Charles Wood was noticed) were not so fortunate. The sewage part of the Corporation Bill occupied Mr. Heywood Johnstone's Committee until they adjourned on Thursday; and those who were in attendance merely for the gas clauses had to return home for the week-end, disappointed—having wasted four or more days. The Southport Water Bill also got safely through the first Committee stage. Glancing over the list of Bills with which the session started, it is now pretty safe to say

that gas measures at any rate will not protrude so noticeably in the proceedings in the Committee rooms during the next few months as they have done at corresponding periods of the last two or three sessions.

The Mond Proceedings Outlined. The estimate of the opposition to the Mond Gas Bill as to the length of time they would probably require to present their several cases to Colonel Welby's Committee proved to be a little within actual needs; and it was not until about the usual time for the rising of the Committee on Friday that the legal representatives and witnesses of the numerous authorities and companies appearing against the measure concluded their task. Considered as a whole, their arguments (which were exceedingly well presented) constituted a very strong appeal against the further passage of the Bill. There was, of course, a great deal of reiteration; but this could hardly be avoided under the circumstances. As the cases for the different opponents were unfolded, it was seen that the suggestion, to which reference was made last week, as to a combination case being presented on behalf of the antagonistic forces, would not, had it been acted upon, have given sufficient stress to distinctive local conditions in the several areas affected. The crowd of interested parties and spectators the previous week was not repeated in the past. As each opposing case was completed, so the persons concerned in it unlinked themselves from the others and departed their various ways; so that by Thursday and Friday, the number present had thinned down to a mere shadow of that of the preceding week.

Busy men will find it a somewhat heavy task to read through the report of the proceedings which we are publishing in the "JOURNAL." But the matter is one of such general interest, and the novelty of the scheme will give to it an historical value, that our record has been allowed to extend to an unusual length in order that points of importance should not slip through a too free condensation. The report this week carries us down to the end of the case submitted by Walsall; and an account of the remainder of the proceedings will, if space permits, be published next week. The speeches and evidence are so full of detail, and so many interests are involved, that it would be a hopeless task to even try to give, in the short space of two or three paragraphs, what could be fairly described as a summary. However, we will try to present, for the benefit of those who cannot afford the time to read the full report, a rough outline of the points around which the promoters' case was built up, and upon which the hostile troops to a large extent directed their attacks.

Taking first the promoters' case. In last week's issue, we published a map which showed the area of operations, the local and gas-supplying authorities within the area, and the positions of the lands scheduled by the promoters for acquisition for the purposes of their works. The principal evidence for the Bill was tendered by Sir Frederick Bramwell, Lord Kelvin, Mr. Herbert Humphrey, Professor Dewar, and Mr. H. E. Jones; and at the rear was a big array of manufacturers, who recognized in Mond gas the one thing required for the economical conduct of their several industries. The scheme, as put forward by the promoters, contemplates the laying down of five stations, and the distribution system. It is computed that the total cost would be £789,686, of which £427,000 would be absorbed by land, railway sidings, and works, and above £360,000 for distribution. The capital proposed is a round million; so that, as the Company only expect to get 1000 consumers, provision is made for £1000 capital for each. The reasonableness of these estimates was spoken to by no less an authority than Mr. H. E. Jones, and doubted by another gentleman of eminence, Mr. Corbet Woodall. Mond gas is made from a cheap bituminous slack; and from a ton, it is stated, 140,000 cubic feet of gas are produced. It is calculated that 180,000 tons of fuel would be required annually at the five stations. The cost of this quantity would be £67,500, or equal to 0·643d. per 1000 cubic feet. The manufacture of the gas, so the promoters say, is accompanied by the recovery of ammonia amounting to about four times as much as is obtained in ordinary gas-works practice. For the economical distribution of the gas, it is proposed to compress it to about 7 lbs. Of course, Mond gas has, according to the promoters, many advantages over all other kinds of producer gas, in respect of its suitability for numerous industrial purposes—particularly for motive power. Throughout the proceedings, the economy of gas-engines compared with steam-engines was generally admitted. It was comforting to the coal-gas faction present to hear that it has not yet been discovered how to make Mond gas available for lighting purposes. The promoters, too, expressed themselves as willing to be prohibited from supplying the gas for domestic purposes, and to be bound to a minimum supply per consumer of a million cubic feet a quarter, which would be equivalent to roughly 250,000 cubic feet of coal gas. The cost of Mond gas to the consumers was variously placed at 1½d. to 2½d. per 1000 cubic feet. Naturally, a great deal was made of the experience acquired as to the capabilities of the gas at the works of Messrs. Brunner, Mond, and Co., at Winnington.

Nearly six days were absorbed by the opposing cases; the local authorities or gas companies of Birmingham, Walsall, Smethwick, Oldbury, West Bromwich, Bilston, Wolverhampton, Willenhall, Stourbridge, Dudley, and Handsworth all claiming a hearing. Among the witnesses appeared many whose names are more or less familiar to readers. For example, in the order in which they were called, there were Mr. Charles Hunt, Mr. E. Orford Smith, Mr. Dugald Clerk, Mr. Corbet Woodall, Mr. John Cooper, Mr. B. W. Smith, Mr. J. Emerson Dowson, Mr. E. B. Ellington, Mr. W. J. Sturges, Mr. A. Cooke, Mr. T. Hudson, Mr. C. W. Pinkney, Mr. Henry Davey, Mr. W. H. Y. Webber, Professor Vivian B. Lewes, and Mr. William North. There were several other witnesses; and, in the early part of the proceedings, among those who had been retained was noticed Mr. Isaac Carr. In the course of the evidence, the great extent of the interests and the capital involved in the gas undertakings of the district proposed to be opened up by the Mond scheme was carefully placed before the Committee; and several of the gas-supplying authorities prayed to be excluded from the operations of the Bill in the event of it being passed in any form. The hardship which would fall upon them if their statutory rights were disturbed was pointed out; and the evils which would be wrought by competition were explained. The Committee were also assured that there was no urgent need which the existing works could not meet in respect of gas supply. Avowedly the scheme as proposed is a new departure in gas legislation; and the telling argument was advanced that it practically amounts, if passed, to a permanent monopoly for a patented article over a large area. The opposition further essayed to convince the Committee that Mond gas could not be supplied so economically from central stations as by the manufacturers themselves putting up plants on their own premises, and having the production of the gas under their own control. In proportion, the amount of coal which would be used at a central station would, it was maintained, be greater than that required if the gas was produced on the consumer's own establishment; and the cost of privately produced gas would, it was declared, be 50 per cent. less than that made at a central station. The Committee were reminded of the advantage that coal gas possessed over Mond gas, in that it is applicable to the three purposes of lighting, heating, and motive power; and it was maintained that from 4 to about 4½ times the quantity of Mond gas would have to be distributed to get the same effect for heating or motive power. Nearly all the witnesses attacked the merits of the gas; and the almost universal usefulness claimed for it for industrial purposes was disputed. The scientific witnesses could find no special advantage in Mond gas over producer and fuel gases made by other systems; and the Committee were clearly shown that Mond (to use a phrase employed on another occasion in regard to the same subject) was "not the only pebble on the beach." For this reason, if for no other, a monopoly should not be granted. No provision is made in the scheme for storage to meet fluctuating demands; and this was described as a decided flaw. Local authorities also objected to interference with their control of the streets. From the financial point of view the scheme was declared unsound. There would not, it was contended, be a sufficient demand for the gas to justify the great expense proposed to be incurred; and hints were thrown out that investors who put their money unwittingly into the scheme would run a great risk of losing it. It was not considered that Mond gas could be profitably supplied at 2d. or 2½d. per 1000 cubic feet; and, in fact, the Committee were told that the whole of the estimates were unreliable.

Yesterday morning Mr. Balfour Browne addressed the Committee on behalf of the promoters—his speech, which was well conceived and took a broad survey of the whole of the proceedings during the ten days' hearing, lasting a full two hours. About an hour and a quarter was then required by the Committee to consider their decision; and, in a crowded room, Colonel Welby announced it to the following effect: That, in addition to points promised by Counsel for the promoters, the two following stipulations should be made (1) That any new development of gas permitted by the Bill must be certificated by the Board of Trade; and (2) that of the shares to be allotted to Dr. Mond 40,000 are to rank for dividend with the other shares, and 35,000 to rank for dividend after the holders of other shares have received 5 per cent. per annum. Subject to these conditions, the Committee found the preamble of the Bill proved. All the local authorities, so far as we could gather, reserved their right to oppose in the Upper House. Dr. Mond, we learn, is thoroughly satisfied with the decision; he could hardly be otherwise.

The Decision.

South Metropolitan Gas Bill. It is pretty evident that it will be some time yet before Metropolitan gas affairs sink down to a peaceful level. When the South Metropolitan Gas Bill came before Sir Henry Fletcher's Committee last Thursday, all the Local Authorities on the North side of the Thames were represented by a substantial row of Counsel whose instructions were to defend the rights (legal, if unfair to the consumers) of the authorities, and to prevent the Company who have now become to be regarded among them as the "common enemy" obtaining any rope which will permit them to keep outside Parliament, and so away from their harriers, for even a single session, until such time as they submit themselves to the recommendations of Sir James Rankin's "Powers of Charge" Committee. The South Metropolitan Bill is really a very simple one, and is composed of two parts. First, the Company ask for authority to raise £1,500,000 of new capital, with £500,000 borrowing powers; but, on a rough estimate, some £900,000 of this would be required to give effect to the powers sought in the second part. Before passing to this section, it may be noticed as an interesting development of Mr. Livesey's policy in the direction of the affairs of the South Metropolitan Company that he seeks by the Bill to reverse the present legislative order of things in regard to the issue of new capital by offering it to the consumers of gas in the district at a fixed price before submitting it for sale by auction or tender. This change, the London County Council tried to obstruct. On Thursday and Friday last Mr. Livesey was the only witness; but in the story he had to tell there was little that was really new. But this was not Mr. Livesey's fault. It is one of the beautiful or unfortunate (whichever adjective may suit the particular case) features of our Parliamentary Committee system that, however frequently the same subject comes up for discussion, with a change of session and a change of Committee, the whole story has to be repeated.

As to the second part of the Bill, it provides for the putting into execution of the recommendation of Sir James Rankin's Committee that the district belonging to the Gaslight and Coke Company south of the Thames, including the Nine Elms Gas-Works, should be transferred to the South Metropolitan Company. The London County Council, the City Corporation, and the other northern authorities do not object to the transfer *per se*, but they do object to its incidental effects—viz., that, without parliamentary restriction, the purchase would put into the hands of the Gaslight and Coke Company money which would enable them for the present to evade the recommendations of the Powers of Charge Committee, and that it would furthermore (without an express proviso to the contrary) remove from them the present limitation as to the price to be charged for gas for public lighting north of the Thames. This—as all readers must be aware—is controlled by the price of gas in the Company's southern area, which, in its turn, is controlled by the price charged by the South Metropolitan Company. With the view of satisfying the objectors, Mr. Livesey proposed on Thursday that a clause should be inserted in the Bill providing, among other things, that the agreement for transfer should not have effect until the standard price of the Gaslight Company was reduced from 3s. 9d. to 3s. 6d. for 16-candle gas. But obviously such a clause could not be discussed, much less accepted, without the fullest consideration all round; and so the

Committee agreed, shortly after noon on Friday, to adjourn the proceedings until yesterday.

Yesterday morning the Committee considered in private the arguments previously put before them by Counsel, both for and in opposition to the suggested proviso; and they came to the decision that it could not be accepted, as it did not come within the notices. Pointing out that the position had been rather complicated by the rejection of the Gaslight and Coke Company's Bill on second reading, Lord Robert Cecil ventured to suggest (in order to remove any difficulty) a new proviso in these words: "Provided that no such agreement shall have effect until the Gaslight and Coke Company shall have obtained from Parliament powers to raise additional capital." The only effect of the clauses with this proviso, he pointed out, would be to enable the South Metropolitan Company to buy the Nine Elms district when, and as soon as, the question of purchase had been settled with reference to the Gaslight and Coke Company. One or two of the opposing Counsel objected to the new proviso, and argued that the whole matter should be left open for free discussion when the Gaslight Company were before Parliament. Further conversation clearly showed that all the South Metropolitan Company wished for was to obtain statutory power to purchase (without having to incur the expense of coming to Parliament again) as soon as the Gaslight and Coke Company were in a position to sell—thus leaving at the present stage all terms and conditions of transfer for consideration on a future occasion. The Committee eventually rejected the new proviso, upon which Mr. Littler suddenly awoke to the fact that the purchase clauses would be better with the proviso than without it. The Chairman explained that the Committee refused it because, like the other proviso, it did not come within the notices. The consideration of the purchase clauses as they stand in the Bill was then proceeded with; Mr. Livesey being recalled to continue his evidence. He explained that his Company only wanted this permissive power so as not to have to come to Parliament again on the matter. At the same time he believed the purchase would be of value all round—to the South Metropolitan Company as it would enable them to meet the demands for gas in their western district, and to take up increases of business, without extending at East Greenwich. Mr. Livesey was the only witness for the Bill; and the opposition did not call evidence—it being considered that the matter was entirely one for argument. Counsel argued the question up and down at some length; and then twenty minutes sufficed the Committee for arriving at their decision. They declared the preamble of the Bill proved; but there were four conditions attached. The first three were that the agreement for the purchase of the Nine Elms works and district should not have effect until the Gaslight and Coke Company shall have obtained from Parliament powers to raise additional capital; that the £900,000 or upwards to be paid for the transfer shall be dealt with by the Gaslight and Coke Company in their application to Parliament; and that any income which may be derived by them by reason of the higher rate they will be in a position to charge the Local Authorities for gas supplied for public purposes shall be devoted to the relief of private consumers. With regard to the issue of stock to private consumers in the South Metropolitan district, the promoters sought to be allowed to issue it at a price not exceeding 7½ per cent. below the market price; but the Committee limited this to 5 per cent.

Borrowing Powers for Leeds. One of the ambitious measures of the session was the Leeds Corporation (General Powers) Bill; and before it left Lord Dartrey's Committee last Thursday, it had been very seriously mutilated. The gas clauses, however, went through without change. They provide for additional gas capital to the extent of £300,000, repayable in 40 years. Alderman Lowden, the Chairman of the Gas Committee, gave evidence which amply proved the necessities of the undertaking in which he takes such a large personal interest, and which has had a splendid run of prosperity under his guidance and that of Mr. R. H. Townsley, the Chief Engineer and General Manager. The price of gas is 2s. 3d. per 1000 cubic feet, with 5 per cent. discount, and no meter-rent. Such a condition cannot fail to produce development of business and contented consumers. It is perhaps a little bit doubtful whether, in the best interests of the undertaking, the 40 years for repayment should be applied to the whole of the £300,000.

The Curious Case of Golborne. About the Golborne case which was before Mr. W. S. Caine's Committee on Thursday and Friday last and the Crawley and Horley case of a few weeks ago, those readers who recollect the circumstances of the latter will recognize some resemblance. The gas-works for the supply of Golborne were erected about 1855 by a Mr. Lawson, who was the sole proprietor. In 1861, the Leigh Gas Company applied to Parliament for statutory powers, and included in their district the township of Golborne. Owing to want of capital, Mr. Lawson did not oppose the Bill, which duly became law. Six years later, a Company was formed who purchased Mr. Lawson's undertaking, and established the present works. Then (it is necessary to follow the history up), in 1878, the Leigh Local Board promoted a Bill for the purchase of the undertaking of the Leigh Gas Company; and the Golborne Company decided to petition against the Bill. This decision, however, was never carried into effect—the Leigh Local Board giving an assurance to the Company that they would never attempt to supply their district. On the strength of this assurance, the Company withdrew their intended opposition. Since then, they have continued to develop their undertaking undisturbed by the Leigh Authority (now the Corporation) until last year, when the Company determined to promote a Bill to give them statutory powers and to repeal the power of the Corporation for supply in Golborne. Then Leigh, exercising their legal (but doubtfully moral) rights, laid a main to Golborne, and commenced competition with the Company. The Corporation now opposed the Company's Bill on the ground that it would be a dangerous precedent to allow a private Company to deprive them of their powers. There can be little question that, had the original owner of the Golborne works been in a position to defend himself when the Leigh Gas Company asked for the right of supply over his district, Parliament would have granted him protection. There is also another view of the position. When the Bill was before the Committee last week, it was argued on behalf of Leigh that, when the Local Board purchased their gas-works, they must have paid some consideration for the right of supply in Golborne district. It would be interesting to see that consideration reduced to hard cash, and learn its amount. The fact that at the time an understanding was arrived at that the Golborne Company should not be disturbed, and that until last year no attempt was made on the part of Leigh to exercise their rights in Golborne, are sufficient indications of the value formerly set upon the "consideration" paid for those rights. The argument need not be laboured; for when Mr. E. H. Stevenson (for Leigh) came before the Committee on Friday afternoon—recognizing that, whichever way the decision of the Committee went, an injustice might be done to one or other of the parties—he suggested that the fairest way to bring to an end the present position was by the parties agreeing to the insertion of a purchase clause on arbitration terms in favour of Leigh. [Mr. Stevenson, it may be remembered, appeared for the Crawley Company, who occupied the position of the Golborne Company, in the similar case already referred to.] Although he did not say so, Mr. Ram (the leading Counsel for the Golborne Company) appeared disposed to accept the offer, but on non-competition terms. To this extent, Mr. Balfour Browne for Leigh would not commit himself. As, however, the way appeared open for an agreement, Mr. Caine gave the parties until yesterday afternoon to discuss the matter. During the adjournment, correspondence passed between them; and it disclosed, when read yesterday by Mr. Ram, that the Company, while they did not wish to part with their works, were disposed to meet the evident view of the Committee. There was really very little difference between the parties—one was willing to sell, and the other to buy on arbitration terms; but the Company desired to be treated as though they had no competitor in the district, and this the Leigh Corporation would not concede. Mr. Balfour Browne, for the Corporation, argued the point at great length; but, possibly with the idea of getting him to recede from his position, the Chairman jocularly remarked that the Committee regarded his clients as filibusters, and then added—rather precipitantly we think—that the Committee were going to declare the preamble of the Bill proved. However, after further discussion, the room was cleared; and, on the re-admission of the parties, the Chairman announced that the preamble of the Bill was proved, but that the Committee would, if desired, grant Leigh a purchase clause on non-competition terms. Mr. Balfour Browne pointed out that he had not been heard on the preamble; and consequently he should withdraw, reserving his case for the Upper House. The Committee also fixed the standard price to be charged for gas at 3s. net. The advisers of the Golborne Company were Mr. Corbet Woodall, Mr. Thomas Newbigging, and Mr. J. Timmins; while retained on the side of Leigh (in addition to Mr. John Foster, the Corporation Gas Engineer) were Mr. E. H. Stevenson and Mr. Samuel Glover. Our usual report will appear next week.

Omagh Tactics and Humour. The Omagh Gas Company's Bill has been the means of bringing that little Irish town into more prominence in the political world than perhaps it has ever before received in its history. When the Local Authority came to London a few weeks since, and thought they were going to get all they wanted from Parliament for the mere asking, and found out their mistake after an inquiry into the Bill by a Committee of the Upper House, they were wrathful. On the afternoon of the day of their tribulation, a rumour was current that they had conceived the wild idea of interviewing some of the Irish Members of Parliament to urge them to make an effort to secure the rejection of the measure on its second reading in the Lower House. They evidently succeeded; for when the Bill came before the House last Tuesday, the usual form of motion when the overthrow of a Bill is desired was introduced by Mr. Murnaghan. The division was taken with a small House; and, the opponents obtaining a substantial following, the Bill was only carried by a narrow majority. There was no justification for taking such an extreme course, and wasting the time of the House, over a measure of this caste; and more especially as the Omagh Authorities do not appear to know exactly what their future course of action will be in regard to the gas undertaking. On the following day, Mr. Tully, M.P., gave notice to the authorities that the opponents would no longer resist the progress of the Bill, as certain terms had been offered by the Company, and had been accepted by the representatives of the Council. The Company have agreed to reduce the proposed capital from £15,000 to £12,000, and the standard price from 5s. to 4s. 6d. per 1000 cubic feet. The Omagh District Councillors are Hibernian to a degree. We have shown this from one point of view; but there is another, and that is their humorous side. We are now told that they are willing to become the owners of the gas-works at a price of £12,000, which would give the Company twelve years' purchase. The Omagh Councillors must be jocular fellows.

Parliamentary Committees and Electrolysis. The decisions of Parliamentary Committees on the question of electrolysis appear as vagarious as the wanderings and effects of electrical currents themselves. Twice in the Lords, Committees have, at the instance of Gas and Water Companies, recognized the justice of making provision in Electrical Tramway Bills for the fixing upon the undertakers of the responsibility for any damage that might be done to gas and water pipes by electrolytic action, but Commons Committees so far have always accepted the view that the Board of Trade regulations afford sufficient protection. If these regulations are so efficient in ensuring that electrical currents are kept within their proper bounds, it is difficult to see why electric tramway promoters, whenever an application is made for the insertion of a clause placing the liability upon them for any damage that may arise from their operations, should put forth so much effort in resisting the insertion of the clause. The escape of current being (according to them) practically impossible, or at any rate a negligible quantity, they might surely accept such a clause with a benevolent smile. There is something about their argument, and the position they take up, that is altogether illogical. The Bexley Electrical Tramways Bill has, within the last few days, been before a Committee of the House of Commons; and backed by the precedents of last session in the London County Tramways Act and the South Wales Electric Power Distribution Act and the Sheffield precedent of this session, the South Metropolitan Gas Company and the Kent Water-Works Company asked for the insertion

of the "responsibility" clause. How in face of the testimony given, for the applicants, by Mr. George Livesey and Professors Perry, Dewar, and Ayrton the Committee refused the reasonable request of the Companies, it is difficult to see. Referring to that evidence, Sir Courtenay Boyle, the Permanent Secretary of the Board of Trade, said to the Committee: "It is evidence which deserves the most careful consideration of Parliament. It is evidence given by men of the highest possible position, and the greatest possible independence, and requires very careful consideration." Again, he remarked: "The gas and water companies are in a somewhat different position from the telephone or telegraphic companies. They are innocent users of the earth. They do not cause any mischief by the distribution of electrical energy which may damage their neighbours; and it is almost impossible for them to protect themselves against any such electrolytic action if any occurs. To that extent, they have a great claim on the consideration of Parliament." After such an expression of opinion from such a high quarter, we are content to believe that the justice which was claimed on this occasion, but was refused, will before long be accorded to every gas and water company without subjecting them to the great expense and worry that have now to be incurred in seeking protection. In the meantime, however, both gas and water companies must continue to agitate, as opportunity occurs, in order that the matter may not be allowed to slumber. The South Metropolitan Company have determined to do their part; and on this Bexley Bill and another promoted by the London County Council, they will put in an appearance when the measures reach the Upper House—then, we hope, with better success.

Southport Water-Works Purchase. The Corporation of Southport, the Birkdale District Council, and the West Lancashire Rural District Council are proposing by a Bill to constitute a Joint Water Board for the purpose of acquiring and carrying on the undertaking of the Southport Water-Works Company. The concern is now a large and prosperous one; and it has a capital of £425,000. No serious charges are made by the Local Authorities against the administration of the concern. The circumstances, however, under which the present Bill was promoted are these: The Company last year applied to Parliament for power to construct new works and to obtain additional capital, and they were granted authority to raise two-thirds of the capital asked for. But it was stipulated that this should not be taken into account by an arbitrator dealing with the question of the price to be paid for the undertaking in the event of the Authorities agreeing to form a Joint Board and promote a Bill for purchase in the present session. The discussion of the Bill extended over the greater part of the sittings of Earl Jersey's Committee last Wednesday and Thursday. In view of the provision in the Company's Bill of last session, it was almost hopeless to expect to overthrow this Purchase Bill; but Mr. Balfour Browne for the Company made a gallant effort to do so. He urged that there had been no general recognition by Parliament of public policy in the matter of transferring water-works to local governing bodies; and in this case certainly no good ground was shown for doing so. If, he further contended, a water company were to be expropriated when they were fulfilling their duty merely because the local authorities were ambitious, a very serious injury would be done to the country, by discouraging investment in private enterprises. His speech in the Company's defence was a brilliant piece of rhetoric and sound argument; but while it appeared to sway all who heard it, the Committee were faced by the provision of last year which contemplated purchase in this one. They accordingly, after a few minutes' deliberation, declared the preamble of the Bill proved.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Derwent Valley Water Board Bill, Devonport Corporation (Gas) Bill.

Bills read a second time and committed: Colwyn Bay and Colwyn Urban District Gas Bill, Leatherhead Gas Bill.

Bill reported: Gravesend Gas Bill.

Bills reported, with amendments: Faversham Water Bill, Poulton-le-Fylde Gas Bill, Prestatyn Water Bill, South Essex Water Bill, Southport Water (Transfer) Bill, Weston-super-Mare Gas Bill.

Bills read the third time and passed: New Swindon Gas Bill, Prestatyn Water Bill, Shrewsbury Gas Bill.

The Elland Gas Bill and Heywood and Middleton Water Board Bill have been referred to a Select Committee, consisting of Lord Pirbright (Chairman), the Earl of Carnwath, the Earl of Northesk, the Earl of Buckinghamshire, and Lord Saye and Sele; to meet on Tuesday, May 14.

The Grangemouth Water Bill and the Hamilton Burgh Provisional Order Confirmation Bill, to confirm Provisional Orders made under the Private Legislation Procedure (Scotland) Act, 1899, have passed through all their stages and been sent to the Commons.

HOUSE OF COMMONS.

Tuesday, May 7.

OMAGH GAS BILL.

On the motion for the second reading of this Bill, which was brought from the House of Lords and read the first time on the 25th ult.,

Mr. MURNAGHAN moved, as an amendment, that it be read a second time upon that day six months. He said he did so on behalf of the Local Authority, the gas consumers, and 75 per cent. of the ratepayers of the town of Omagh. The Bill, which was promoted by the local Gas Company, was a high-handed effort to prevent the District Council from obtaining control of the gas supply. This valuable asset, he contended, properly belonged to the Local Authority, and the profit from it should go to the relief of the rates instead of into the pockets of private individuals.

Mr. RENTOUL supported the Bill. He said he had not a particle of interest, direct or indirect, in the Bill; but he considered that the question should be investigated by a Committee—whether the Company were being properly treated by the Council, or whether the terms of purchase proposed were unfair.

Sir W. FOSTER supported the amendment. He said the present value of the Company's works was estimated at £9000, and by the Bill they sought power to obtain for them the sum of £15,000.

Sir J. HASLETT urged that the Bill should be read a second time, and denied that the Company would be able to get any "fancy" price for their property. The price would be fixed according to the value of the concern as it stood at the present time.

Mr. TULLY strongly opposed the Bill, on the ground that it would create a vicious monopoly which would stifle the industrial expansion of Omagh.

After some further remarks, the House divided, when the numbers were: For the motion, 184; against it, 170—majority, 14. The Bill was accordingly read a second time.

Thursday, May 9.

RICKMANSWORTH AND UXBRIDGE VALLEY WATER BILL.

On the order for the second reading of this Bill,

Sir F. DIXON-HARTLAND moved, as an amendment, that the second reading be deferred for six months. He said the Company promoting the Bill was really a child of the Southwark and Vauxhall Water Company, and the object was to take water which could not be spared from the watershed of the Thames in order to supply districts which were a long way from the river. The County Councils of Bucks, Herts, and Middlesex, as well as every Local Authority affected, were dead against the Bill. He submitted that the time had come when Parliament should say that, until a Water Bill was brought in by the Government, no more water should be abstracted from the Thames for the benefit of districts which had no right to it.

Major GRENFELL seconded the amendment, and said the Bill was a scheme of spoliation and robbery.

Mr. BOULNOIS said he had no personal interest in the Bill, but he did not think it deserved to be described in the terms used by the previous speaker. It was a very harmless Bill after all. Its objects were to authorize an existing Company to lay two lines of pipes to outlying districts where they already had authority to supply water under an Act passed last year, and they also asked for power to extend their limits to various parishes which had at present no system of water supply. As to the objection that, under the Bill, water would be taken from one county into another, he would point out that it was difficult to draw a hard-and-fast line in the matter, and to say that the boundaries of counties should decide questions of water supply. Many provincial towns went far afield for their water; and it was well known that the London County Council sought their source of supply in Wales. But these objections would be best decided in Committee, after hearing evidence. He thought there would be no difficulty in inserting in the Bill a provision limiting the supply, so as to prevent substantial injury being done to any county. He hoped, therefore, that the usual course would be followed in the case of a small Bill like this—that it would be read a second time and sent to a Committee.

Mr. MELLOR said the principle of the Bill was so vicious that the House ought to depart from the course it adopted in the case of nineteen Private Bills out of twenty, and refuse its second reading. Unless the House protected the rights of the poor people who had wells in the district affected by the Bill, they would be seriously injured in their water supply. It was not right to take water from one district in order to supply another. In a matter of this kind, the voice of the Local Authorities should have great weight; and not only they, but the Thames Conservancy—to whom the people of London owed a debt of gratitude for the way they discharged their duties—were opposed to the Bill. In the circumstances, therefore, it ought to be rejected.

Mr. HUDSON also opposed the motion, on the ground that under its provisions the promoters would abstract a very large quantity of water from Hertfordshire for the use of Buckinghamshire.

Mr. CARLILE said he was delegated by the Bucks County Council to oppose the Bill as being inimical to the interests of the county.

Mr. BUXTON expressed the opinion that the time had come when demands such as the present on the part of the small water companies ought to be considered in connection with a general scheme.

Mr. ROTHSCHILD pointed out that the district bordering on the area claimed by the Company was supplied entirely by underground reservoirs of water in the chalk. Although they promised to use the water obtained in their own area, they would take water surreptitiously from the surrounding district, and cause a dearth there.

The motion for second reading was negatived without a division.

The following further progress has been made with Bills:—

Bills brought from the Lords, read the first time, and referred to the Examiners: Bath Gaslight and Coke Bill, New Swindon Gas Bill, Otley Gas Bill, Sheffield Corporation Bill, Shrewsbury Gas Bill, Sutton-in-Ashfield Urban District (Water) Bill.

Bills read a second time and committed: Alfreton Gas Bill, Aspatria, Silloth, and District Water Bill, Oakham Water Bill.

Bills reported, with amendments: Arlesey Gas Bill, Bingley Urban District Council Bill, British Gaslight Company Bill, Burton-upon-Trent Corporation Bill, Dorking Gas Bill, Swanage Gas and Water Bill.

Bills read the third time and passed: Derwent Valley Water Board Bill, Devonport Corporation (Gas) Bill, Long Eaton Gas Bill, Tees Valley Water Board Bill, Wells Corporation Water Bill.

A late petition having been presented by the Winsford Urban District Council to enable them to acquire the undertaking of the Over and Wharton Gas Company, the Examiner reported non-compliance with Standing Orders. The matter was referred to the Standing Orders Committee, who reported that the Standing Orders ought to be dispensed with, and the parties allowed to proceed. Their report came before the House on Wednesday, and the Bill was ordered to be brought in. This was done next day, and the Bill advanced for second reading.

HOUSE OF COMMONS COMMITTEE.

Thursday, May 9.

(*Before Sir* HENRY FLETCHER, *Chairman, Mr.* STRACHEY, *Mr.* MORRIS, *and Mr.* TOMPKINSON.)

SOUTH METROPOLITAN GAS BILL.

This is a Bill to empower the South Metropolitan Gas Company to raise additional capital, and to purchase, by agreement, so much of the southern portion of the undertaking of the Gaslight and Coke Company as was situated in the County of London south of the Thames.

The Counsel for the Bill were Mr. BALFOUR BROWNE, K.C., Lord ROBERT CECIL, K.C., and Mr. ROSTRON. The petitioners were represented as follows: The Corporation of the City of London, by Mr. LITTLER, K.C., and Mr. A H. RIGG; the Borough of Shoreditch, by Mr. ALLAN; the Borough of Fulham, by Mr. SYLVAIN MAYER; the Borough of West Ham, by Mr. EDWARD MORTEN; the London County Council, by Mr. FREEMAN, K.C., and Mr. BERNARD WILKINSON; the Borough of Westminster, by Mr. H. C. MUNROE; the Borough of St. Pancras (reserved); the Borough of St. Marylebone (reserved); the Gaslight and Coke Company, by Mr. POPE, K.C., and Mr. NEVILLE; the East Ham Urban District Council, by Mr. FORBES LANKESTER; the Borough of Hackney, by Mr. BEVEN; and the Borough of Paddington (reserved).

Mr. BALFOUR BROWNE, in opening the case for the promoters, said the Metropolis was divided between three great Gas Companies. There were the South Metropolitan and the Gaslight and Coke Companies on the south side, the Gaslight and Coke Company on the north side, and the Commercial Company on the east. The south side of the Thames was the district of the South Metropolitan Company; but there was a piece of the area at Nine Elms, or rather two pieces, where the supply was given by the Gaslight and Coke Company. One of the objects of the Bill was to transfer, by agreement, this area from the Gaslight and Coke Company to the South Metropolitan Gas Company. The Company he represented had been formed out of a great number of amalgamated Companies. The first Company, he thought, got their Act in 1842; and in 1876 they obtained a further Act under which they were empowered to amalgamate with another Company on the south side. The amalgamation ultimately included the Surrey Consumers' Company, the Phœnix Company, and the Woolwich, Plumstead, &c. Company. They supplied the whole of the district south of the Thames except the little pieces at Nine Elms, which were supplied by the Gaslight and Coke Company. The Gaslight and Coke Company was also the result of a great number of amalgamations. They had an Act in 1843, in which was an important clause, which was taken over as a heritage from the London Company; and upon this clause a great deal of opposition to the present Bill turned. The clause said: "That the United Company"—the one formed or amalgamated by that Bill—"shall not charge in the district of the London Company south of the River Thames a higher price per 1000 cubic feet of 16-candle gas, either for public or private lighting, than the price for the time being charged by the South Metropolitan Gas Company for gas of the same illuminating power. And section 86 of the City of London Gas Act, 1868, shall apply as against the United Company to the whole of the public lamps supplied with gas of similar quality, but not to private consumers north of the Thames." The object of this clause was to secure that, in the district around Nine Elms, the Gaslight and Coke Company should never charge the consumer of gas more than was being charged by the South Metropolitan Company; and this existed to-day. But the latter portion of the Act made section 86 of the City of London Gas Act, 1868, apply to the district. This section said the Company should not charge a higher price per 1000 cubic feet than the lowest price charged to any consumer. The effect of the two clauses was that the Gaslight and Coke Company to-day could not charge a higher price in the Nine Elms district than was charged by the South Metropolitan Gas Company, though on the north side they were charging a much higher price. Under the section, the lowest price they were charging in any way was to be the rate they charged to the Commissioners of Sewers—who were now the Corporation of the City of London. The effect of the two sections was that the price on the south side of the Thames was regulated, not by what the gas cost the Gaslight and Coke Company, but by what it cost the South Metropolitan Company; and the Commissioners of Sewers or their successors got the gas on the north side of the Thames for public lighting at the same price as that at which the South Metropolitan Company manufactured gas on the south side. Every other Local Authority on the north side had been put in exactly the same position as the City of London; so that the whole of the Local Authorities were getting gas for public lighting, at a very much lower price than the ordinary consumers in the Gaslight and Coke Company's district, because their price was regulated, not by the cost of production to the Gaslight and Coke Company, but by the cost to the South Metropolitan Company. Dealing with the past history of the Companies, the learned Counsel pointed out that in 1895 the South Metropolitan Company came for a Bill to consolidate their stock, and to change it into two-and-a-half times its nominal value without increasing the dividend-paying power. In that year, however, the Bill was, somehow or other, rejected. In 1896, it was passed into law, and the Company's stock was converted; and their dividend, instead of being 10 per cent. on the whole stock, was 4 per cent. on two-and-a-half times the amount. The Gaslight and Coke Company, in 1898, did exactly the same thing, with the consent of Parliament; and this Company were also now paying at the rate of 4 per cent. In 1896, the South Metropolitan Company were again in Parliament; and this time they asked to have representatives of their workmen on the Board of Directors, and proposed a profit-sharing scheme with the workmen in their employ. These proposals were sanctioned, and had been carried out; and they were operating most successfully. They had two workmen on the Board, and there was a profit-sharing system, which would tell how well the scheme had worked in the past. In 1898, the House of Commons appointed a very important Committee of Inquiry into certain matters; and it was presided over by Sir James Rankin. What they had to inquire into was the powers of charge conferred by Parliament on the Metropolitan Gas Companies. The inquiry was confined to the three Companies; and they had to report as to the way in which these powers had been exercised, having regard to the difference of price charged by the various Companies. The South Metropolitan Company were supplying gas at a much cheaper rate than either of the other Companies. This Committee of Inquiry sat for eighteen days; and he had before him the proceedings and the report. The inquiry largely consisted of an attack on the management of the Gaslight and Coke Company. He did not want to go into this matter, but what he really had to do with were the recommendations of the Committee. Serious complaints were made against the Gaslight and Coke Company, mainly on the ground that they were charging a considerably higher price for gas than the South Metropolitan Company. Whether the Company explained the matter satisfactorily or not, he was not going to say. For himself, he thought they had good grounds for explaining it; but the Committee were not satisfied on various points, and made certain recommendations which were applicable to all the Companies—to the South Metropolitan as well as to the Gaslight and Coke Company.

The CHAIRMAN: Only applicable to the London Companies?

Mr. BALFOUR BROWNE: Yes; only to the three London Companies. The reference was confined to them. According to the old state of things, the Companies were to be allowed to charge 5s. per 1000 cubic feet of gas. They could not charge more; but if they were able to divide, charging this 5s., a 10 per cent. dividend, and had paid up arrears of dividend, and also had got what was called the reserve fund full, then any two consumers of gas in their district could go to the Justices, and the Justices could order an inquiry by an accountant. If the accountant found that they could reduce the price of gas, the Justices had the power to reduce it. That was the old system, when a maximum price was allowed. But more recently certain gentlemen had invented what was called the sliding-scale; and now they had not got a maximum price, but a standard price. Say that the standard price was fixed at 4s. If a Company could charge 4s., and no more or less, then they were entitled to divide their full dividend of (say) 10 per cent. This 10 per cent. was not allowed now, of course; but 10 per cent. was the old figure. If a Company could reduce their price of gas from 4s. to 3s. 8d., then they were entitled to divide 11 per cent.; but if, on the contrary, the Company worked without economy, and charged 4s. 4d., then they could only divide 9 per cent. This was the principle of the sliding-scale. But Sir J. Rankin's Committee recommended that there should be two sliding-scales—first, the standard price of 3s. 3d., to bear 10 per cent.; and then another that was a compensation for the reduction of the standard price. The second recommendation of the Committee was an important one for the purposes of the present inquiry. It was this: "The area south of the River Thames, at present part of the district of the Gaslight and Coke Company, acquired by them on the absorption of the London Gas Company in 1883, should be transferred from the Gaslight and Coke Company to the South Metropolitan Gas Company, on a reasonable price being paid by the latter to the former Company for their property in the southern area." This was the recommendation he (Mr. Balfour Browne) was there to carry out. As to the first recommendation of the Committee, his Company carried that out last year before Mr. Oldroyd's Committee, and did so to the satisfaction of that body. With regard to the second recommendation, the South Metropolitan Company proposed a clause authorizing the transfer of the southern part of the district of the Gaslight and Coke Company to the South Metropolitan Company, and embodied it in a Bill. This was passed by the House of Commons; but the House of Lords afterwards rejected it, and he now appealed to the present Committee to sanction it this year.

The CHAIRMAN: We have nothing to do with the first recommendation?

Mr. BALFOUR BROWNE was very glad to say they had not. The third recommendation of Sir J. Rankin's Committee was with reference to the charge for meters (automatic machines), stoves, and fittings. With this the Committee had nothing to do either, because it had been dealt with in the London County Council Bill of last session, and had passed into law. The fourth recommendation the present Committee had to do with to-day. It was to the effect that capital powers should not be granted to any Company for more than five years, if, and when, new capital was required, and that Parliament should revise the sliding-scale by way of increase or decrease when application for new capital was made, if the circumstances of the time or condition of the Company, appeared to require it. As to the first part of this, he wanted to say something. They were there to-day to ask the Committee to authorize the raising of £1,500,000 new capital, with borrowing powers to the extent of £500,000—making £2,000,000 in all. Of this, they proposed to devote a sum, roughly estimated at £900,000, to paying the Gaslight and Coke Company for the district on the south side and for their works; and with regard to the remainder of the capital, they were only asking for a sufficient sum to enable them to go on for five years, according to the recommendations of Sir J. Rankin's Committee. Every one of the recommendations of this Committee which bore upon the South Metropolitan Company had been carried out by them—he would say nothing about the Gaslight and Coke Company—every one, that was to say, except the transfer of the district of the Gaslight and Coke Company south of the Thames to themselves. The fifth recommendation of Sir J. Rankin's Committee had reference to a sinking fund; but as the South Metropolitan Company had no obsolete capital, it would be absurd to have such a fund. The Bill, therefore, did not deal with recommendation No. 5. The Gaslight and Coke Company, he believed, had carried out the report so far as recommendation No. 5 was concerned; but he did not know that this was the case. The Bill of the South Metropolitan Company last year did not propose that further capital should be raised, he thought; but it did propose to alter the sliding-scale, and it proposed it in a way that was satisfactory to Mr. Oldroyd's Committee. The Gaslight and Coke Company also had a Bill before the House of Commons; but they did not propose to carry out the recommendations of Sir J. Rankin's Committee. This Company knew their own affairs far better than he did; but it did not commend itself to Mr. Oldroyd's Committee—and that was a strong Committee in this sense, that one of the members had

been a member of Sir J. Rankin's Committee, so that he knew all about the matter. Well, he did not think that members of the House of Commons scamped their work as Counsel did. What did Mr. Oldroyd's Committee do with the Gaslight and Coke Company's Bill? They rejected it. They passed the Bill of the South Metropolitan Company; and without doubt they must have had in their minds the idea that the Gaslight and Coke Company would get a large sum of money—nearly £1,000,000—from his Company for the district south of the Thames. They must have come to the conclusion that, as the Gaslight and Coke Company would get this money, there was no urgency in the demand for new capital. He (Mr. Balfour Browne) now brought in his Bill to carry out what was rejected by the House of Lords last year. He asked for the transference of the southern district, and for new capital. The Gaslight and Coke Company had also brought in a Bill this session; but again they had, metaphorically speaking, snapped their fingers at Sir J. Rankin's Committee. They introduced their Bill, but did not give effect to the first recommendation of the Committee; and, as the present Committee were aware, the Bill, after some discussion, was withdrawn. The object of the measure was to raise new capital for the Gaslight and Coke Company; and it was very strongly put before the House that it was unnecessary to give them further capital powers at present, because they would get this large sum from the South Metropolitan Company. It was urged that, before they obtained further parliamentary powers for new capital, they must put themselves under the recommendations of Sir J. Rankin's Committee.

Mr. FREEMAN: That is not in "Hansard" at all.

Mr. BALFOUR BROWNE read from "Hansard" an extract from a speech by Mr. Lough on the Bill of the Gaslight and Coke Company. He pointed out that the hon. member had said that none of the recommendations of Sir J. Rankin's Committee to the House had been carried out, and had gone on to show that it was not necessary for the Company to have new capital. The hon. member said that one of the objects of the South Metropolitan Bill of that year was to enable the Gaslight and Coke Company to sell to the South Metropolitan Company a large area on the south side of the river; and he stated that when this sale was effected, the Gaslight and Coke Company would get £900,000 of capital without incurring any additional charge for interest—that it was quite obvious that this would, if the Bill passed, enable the Gaslight and Coke Company to go on for some little while. At the same time, it was only fair to the Gaslight and Coke Company for him (Mr. Balfour Browne) to say that, from the works on the south side of the Thames in the district that the South Metropolitan Company were going to purchase, the Gaslight and Coke Company were supplying gas to the north side; and if the South Metropolitan Company took away their works, they would have to erect others to take their place. The capital the South Metropolitan Company were going to give them would be required to some extent for this purpose. But he had nothing, after all, to do with how they were going to spend the capital; the Gaslight and Coke Company must be left to settle this with Parliament. If they could show that the whole £900,000 was required for new works, Parliament would, no doubt, give them power to raise new capital. He was quite certain that Parliament was not going to cripple a great industry like that of the Gaslight and Coke Company, if they would put themselves in line, as his Company had done, with the report of Sir J. Rankin's Committee. But, as he said, it was not his concern. He was prepared to hand over this sum of money, if the Gaslight and Coke Company handed over to him their works and the southern district. And why was he doing it? Because a Committee of Parliament had said that it ought to be done. Coming to the real opposition to the present Bill, he did not think anybody objected to the transfer of the works. What they were objecting to was the incidental effect of the transfer, because, when the district south of the Thames came into the hands of his clients, the Gaslight and Coke Company would not be charging the low price to the public authorities for their gas which they were charging to-day. The difference in price between the two Companies was this: The Gaslight and Coke Company were charging in the district north of the Thames 9d. per 1000 cubic feet more than the South Metropolitan Company were charging south of the Thames—3s. 5d. per 1000 cubic feet was the price of the Gaslight and Coke Company, and 2s. 8d. that of the South Metropolitan Company. The Gaslight and Coke Company were bound in that part of their district south of the Thames to charge the same as the South Metropolitan Company—viz., 2s. 8d. per 1000 cubic feet; but when they charged this 2s. 8d., they were bound to supply all the Local Authorities north of the Thames at the same rate. The result of his Bill, the Local Authorities said, would be this: "You are going to take away the area south of the Thames from the Gaslight and Coke district. The Company will no longer be charging 2s. 8d. anywhere. Therefore we shall lose the benefit of that 2s. 8d. charge. They will then be on the north side charging 3s. 5d.; and we shall be charged 3s. 5d." He (Mr. Balfour Browne) replied to this, that it was not his doing if it was so. But so far as he was concerned, he was quite willing, if the Committee thought it fair, to say that the transfer should only take place if the Gaslight and Coke Company continued to charge the 2s. 8d. He did not care. He was going to charge in the district south of the Thames at Nine Elms 2s. 8d. per 1000 cubic feet to-morrow, just as the Gaslight and Coke Company were charging to-day. Parliament could alter the condition of things of which the Local Authorities complained. It could say: "Nothing shall differentiate the price to be paid by the Local Authorities north of the Thames." But although it was no business of his, he would remark that this was not what Parliament ought to say. They saw what the effect was. People living on the north side of the Thames paid 3s. 5d. Why? Because the Gaslight and Coke Company were selling gas to the Local Authorities at too cheap a rate—viz., 2s. 8d. In fact, they were supplying the public lamps out of the pockets of the private consumer on the north side. He maintained it was wrong in principle that they should subsidize the Local Authorities to the extent of £36,000 a year out of the pockets of the private consumers on the north side, who at present had their gas kept up to 3s. 5d. because of this reduction in price to the Local Authorities. But if the Committee desired it, he was willing to put in a clause to stereotype the 2s. 8d. He was only doing in the present Bill what Parliament had said he should do—taking over the southern district, and paying a fair price for it. But all this was before Sir J. Rankin's Committee. That Committee knew there was a difference of 9d. between his charge and that of the other Company; and they knew all about the Local Authorities having power to get their gas at the cheapest rate. They said: "We think it well that the gas supply of the South of London should be in the hands of one Company, and that the Gaslight and Coke Company should part with this district." He was willing to do whatever the present Committee thought right in the matter. Speaking apart from his own Company, he did not think the privilege enjoyed by the Local Authorities a right one. They ought to pay a fair price for their gas. Suppose the Gaslight and Coke Company could not manufacture gas under 3s. 5d., why were these people to have it at 2s. 8d.? It was absurd; but it did not matter to him.

Mr. FREEMAN: That is not the only objection we take to the preamble. A further objection is that, by this purchase, and this payment to the Gaslight and Coke Company, you put them in the position of being independent of Parliament for a number of years.

Mr. BALFOUR BROWNE remarked that this was not his fault.

Mr. FREEMAN: You have to suffer for your bad companionship.

Mr. BALFOUR BROWNE pointed out that Parliament might say the transfer should not take place until the Gaslight and Coke Company had complied with the recommendations of Sir J. Rankin's Committee. This had nothing to do with him. His friend said that if the Gaslight and Coke Company got this £900,000, they would be able to defy Sir James Rankin's Committee; but the present Committee could say that they should not defy the previous Committee, and could say to the Company: "You shall not get this money until you put yourself in line with that Committee."

Mr. FREEMAN: You cannot do it in this Bill.

Mr. BALFOUR BROWNE said they could. He was asking the Committee to authorize the transfer; and, in consenting, the Committee could say that the transfer should not take effect until so-and-so was done. A similar thing to this was done by the House of Commons in the Bill of last year; but the House of Lords had rejected it. Another way would be to pass the Bill, but prevent his paying the money till the recommendations of Sir J. Rankin's Committee were fulfilled.

The CHAIRMAN: What do the Company propose to do with the £600,000 they are asking for, over and above the £900,000 they wish to pay for this southern district?

Mr. BALFOUR BROWNE said he would give the Committee full evidence about this. It was necessary to spend £200,000 of capital in connection with the property of the Gaslight and Coke Company. It would be found that the promoters had works which would eat up the whole of the remainder of the capital in five years. This point was not touched upon by the opponents in their petitions; and therefore he did not enlarge upon it. The report of Sir J. Rankin's Committee had pointed out that everyone in the northern area of the Gaslight and Coke Company was compelled to pay 1d. per 1000 cubic feet more for his gas by reason that on the south side of the Thames the Company were compelled to sell at 2s. 8d. One penny represented £80,000 a year. Therefore there was a strong public case for passing the Bill. He thought there was also a strong public case against the Metropolitan Boroughs getting gas at a cheaper rate than that at which it could be made. But he had nothing to do with this. If the Committee thought it just, they could protect the boroughs in the Bill. It was not necessary for him to go through the petitions, as he had dealt broadly and generally with their main contentions. There were a great number of them; but they were all very much the same.

Mr. *George Livesey*, examined by Lord R. CECIL.

Witness said he had been Chairman of the South Metropolitan Company since 1885, and had had a life-long connection with the Company, having held for many years the position of Engineer and General Manager. The present Bill had two objects—one to enable the Company to complete the carrying out of the recommendations of Sir J. Rankin's Committee of 1899, by the transfer of the southern district and works of the Gaslight and Coke Company to the South Metropolitan Company; and the other to enable the Company to obtain additional capital. Sir J. Rankin's Powers of Charge Committee had made five recommendations: (1) That the initial price of the Metropolitan Gas Companies be reduced to 3s. 3d., with an increase of the rate of increment of dividend under the sliding-scale from 2s. per cent. to the equivalent of 2s. 8d. per cent. per penny reduction in the price of gas. This was adopted by the South Metropolitan Company in their Act of last year. (2) That the southern district of the Gaslight and Coke Company be transferred to the South Metropolitan Company. A provision for this purpose was inserted in the Company's Bill of last year. It was passed by the Commons, but deleted by the Lords Committee. (3) That the charge for meters, stoves, and fittings of the slot-meter consumers be regulated. This was included in the Company's Bill of 1900; but the London County Council got an Act passed to apply to all three Companies. (4) That capital powers should not be granted for more than five years. He unreservedly accepted this; the only question was as to the proper amount. (5) That an effort should be made to redeem any obsolete or unproductive capital. The Company had no such capital. The property of the Company, as it existed, was worth more than the total capital raised and expended. The undertaking could not now be provided for the capital expended as shown in the accounts.

Lord R. CECIL: Should this Bill be passed, all the recommendations of the Powers of Charge Committee will have been complied with by the Company, will they not?

Witness: Yes; I think so.

Passing to the provisions of the Bill. Dealing first with additional capital, this may be divided into two separate parts?—Yes. We ask, practically, for a round £2,000,000. It may be divided into two equal parts. First, the purchase-money of the southern district and works of the Gaslight Company (say, £1,000,000), conditional on the purchase being effected. The figure agreed last year was £900,000. It will be rather more now, because the business has increased.

And you have to spend something on re-arranging the works?—Some

£50,000 will be required to alter and adapt the works to South Metropolitan requirements.

As to the other £1,000,000, this, I suppose, is additional capital for the next five years?—Yes, that is so. This also is put in the Bill at £1,000,000. But I ought to say that a month or six weeks ago I had an interview with the Parliamentary Committee of the London County Council, with the view to an agreement, when I mentioned a lower figure—viz., £800,000—as the capital for the next five years. This was a guess-work figure, and no agreement was come to. We thought we might avoid opposition. I do not think that the higher figure is unreasonable.

Mr. FREEMAN: I should not hold you to anything you said then. We will deal with the question on its merits before the Committee.

Witness: They asked me if I would accept the five years' recommendation of Sir J. Rankin's Committee. I unreservedly answered "Yes;" and that I adhere to. The only question is the amount. The business of the Company is increasing very rapidly.

Examination continued: The gas sold during the past five years had increased by 37 per cent. The increase in the quantity of coal used had been in the same proportion. The capital they had raised during the five years had amounted to £696,338; but this sum left the Company short of working capital to the extent of quite £200,000 last winter.

Witness then handed in a table showing the loan from the bank during each month of 1900, and during five months of the present year. He pointed out that in October and November the amount borrowed from the bank amounted to £400,000; but in November new capital was issued to the amount of £120,000, on which there was a premium of £26,400—making a total of £146,000 received during that month. But notwithstanding this issue of new capital, owing to the fact that the expenses of the Company were increasing, the amount borrowed from the bank rose in January to £390,000. They then began to get the receipts of the winter quarter; but in March they had to pay the dividends, and their borrowing again increased to £330,000.

Lord R. CECIL: What was the amount of new capital actually required during the past five years?

Witness: We required £900,000, or at the rate of £3 per ton on the increased quantity of coal used. The increase in the last five years, as already stated, has been 37 per cent., or very nearly at the rate of 7 per cent. compound.

Do you expect this increase to be maintained?—I do not expect that an increase at the rate of 7 per cent. compound will be maintained; but I do not believe 5 per cent. compound will be too high an estimate. My reason for thinking this is, that I do not consider the increase in the number of penny-in-the-slot meters will go on at the same rate as during the past five years.

Does the increase consist in penny-in-the-slot meters?—Largely; but it has gone on in all directions.

I believe this penny-in-the-slot meter is one of your children?—No; it was introduced by the Liverpool Company; but we were the first to adopt it in London.

How many of these meters are there in use?—110,000.

Taking the probable increase at 5 per cent. compound in the next five years, this would amount to 312,000 tons?—Yes; and at the rate of £3 per ton, it would give £936,000 as the capital required to carry on that amount of business.

In reply to further questions, witness said that, in addition to ordinary expenditure, a railway for which powers were obtained last session, estimated to cost £25,000, had to be constructed; and certain land had to be purchased to provide for future extensions, at an estimated cost of £40,000. Further, the time had come for the Company to build cottages for their workmen at East Greenwich. Witness hoped to see from 100 to 200 cottages built within the next five years, which, at from £250 to £300 each, would absorb from £30,000 to £40,000. If these three items were added to £936,000, the total amount which the Company would require would exceed £1,000,000. He did not consider this an excessive estimate for the next five years. The Company had a considerable amount of unissued capital. The total was £460,000—viz., £298,711 of ordinary stock, including premiums; and debenture stock, at the price of 94 per cent., £160,767. The Company would have to issue a great deal more stock in the present year. They were now in debt to their bankers to the amount of £240,000 (it ought at this period of the year to be *nil*); and there was £70,000 of the reserve fund uninvested and used as working capital. Therefore the working capital was about £300,000 short; and further issues must be made this year.

Lord R. CECIL: After those issues, would you have a certain amount of unissued capital?

Witness: Yes.

Will you explain to the Committee your course of business with your bankers, because that would make it clear why you must have a balance of unissued capital?—It is the Company's practice to borrow largely of their bankers to carry them through the winter months. For these loans, the Company have no security to give to the bankers; but the latter have the Company's accounts, and regard the uncalled capital as security. It is therefore necessary for the Company to have a certain amount unissued; and seeing that it may be necessary to borrow arge sums running into hundreds of thousands of pounds, it is necessary to apply to Parliament for additional capital when the unissued capital falls to about its present figure.

What would be the effect if you allowed your unissued capital to fall appreciably lower?—If the unissued capital fell appreciably below the present amount, the Company would be compelled to curtail their operations—as, for instance, the supply of slot-meter consumers.

That is the first thing that would be restricted?—Yes, because we are not compelled to supply gas to these meters; but the ordinary consumers can compel us to supply them.

The CHAIRMAN: The slot meters are not permanent?

Witness: They are permanent. The working people are unable to meet the expense of putting up gas-fittings in their houses, and the Company put in the fittings—the consumer then only having to place the penny in the slot. Both the other Metropolitan Companies have curtailed that business for want of capital, which, for the purpose, must be raised at a cheap rate.

Lord R. CECIL: Is there any danger that the Company would issue more capital than is absolutely necessary?

Witness: Certainly not. The sliding-scale and the auction clauses effectually secure that.

Perhaps you would explain to the Committee what the auction-clauses are?—They are clauses which provide that new capital shall be sold either by auction or tender; the Company fixing a reserve price. They were suggested, in 1878, by Mr. Farrer, the then Secretary of the Board of Trade. All our new capital has been raised in this way; and it has been found that neither sales by auction nor by tender are so completely satisfactory.

In reference to these clauses, you now introduce a slight modification?—Yes. By section 5, the Company ask for power, with respect to raising capital, to offer their ordinary capital direct to the consumers of gas, at a fixed price, before offering it for sale by auction or tender. At sales by auction, the buying constituency is limited to those who can attend the sale. Unless the reserve price is put low, the stock is not sold. By putting the reserve price low, the stock is purchased largely by speculators. Sale by tender has the great disadvantage—though we appeal to a larger number of people than by auction—that the public do not understand tendering, and they do not like to offer under the uncertain conditions. If, on the other hand, the stock is offered at a fixed price, they know exactly what they are doing, and will generally give a better price than can be obtained either by auction or by tender. Since 1890, we have adopted the system of offering the stock to the shareholders at a fixed price. The Government and the London County Council have adopted the system of a fixed price in issuing their loans. Under the auction clauses, the only limit to the reserve price is the par value of the stock. Generally, the market price is in excess of the par value. The market price of the South Metropolitan stock, for instance, is now quoted at 130 to 133. In December last, it was 130 to 135. If the Company were issuing new stock, they could fix the reserve price as low as £100. To do so, however, would be greatly against their interest. A certain margin must, however, be permitted; and this in the Bill is limited to £7 10s. below the mean market price. Of this difference, £2 10s. may be due to the amount of accrued dividend on the existing ordinary stock, because it is generally necessary to issue the new stock at Christmas. Therefore the margin will be reduced to £5 below the mean market price, instead of over £30 below it under the ordinary auction clauses. We have, since 1890, issued all our ordinary stock to our consumers in this way, in amounts of £5 and upwards—preference always being given to the small investor—and the total issued is about £719,000. We ask for power to go direct to the consumer, instead of by a round-about way.

Mr. STRACHEY: You do not propose to put the stock up to auction first?

Witness: Not to auction at all. We do not abrogate the auction clauses, as if we do not get the capital from the consumers, we can put the stock up to auction.

Lord R. CECIL: You are bound to offer to the consumer at as nearly as possible the market price; but in any case not more than £7 10s. below the market price?

Witness: Yes. The course that we have adopted in this respect has benefited both the Company and the consumers.

Now in the other part of the Bill it is proposed to give effect to the recommendations of Sir J. Rankin's Committee?—Yes. It will, so far as our Company are concerned, complete the fulfilment of all the recommendations of the Powers of Charge Committee. I have accepted unreservedly all the recommendations.

The CHAIRMAN: Before we leave the part of the Bill dealing with the raising of capital, may I ask if other gas companies have adopted the same principle as that on which you act, of offering stock to the consumers?

Witness: No; except one—the Crystal Palace District Company.

The CHAIRMAN: The Committee are anxious to know whether this new proposal has ever been sanctioned by Parliament, or will this be the first case, if it is sanctioned now?

Lord R. CECIL: It will be the first case, so far as I know. But it has often happened that the South Metropolitan Company have been the pioneers in gas legislation.

Witness: We told the Board of Trade exactly what we are doing; and they have made no objection to our proposal.

Lord R. CECIL: As to the part of the Bill dealing with the purchase of the Nine Elms district, the Gaslight Company have power to sell their southern works and district?—Yes; but the South Metropolitan Company cannot purchase for the sufficient (if for no other) reason that they have no capital for the purpose. The Gaslight Company in 1900 and in the present session, introduced Bills for additional capital; but both were rejected by Parliament, because the Company did not comply with the recommendations of Sir J. Rankin's Committee. The South Metropolitan Company, in their Bill of last year, applied for power to purchase the southern district of the Gaslight Company. They obtained their Bill so far as other matters were concerned; but the clauses relating to the proposed purchase, although passed by the Commons' Committee (presided over by Mr. Oldroyd), were struck out by the Lords. It was felt that if the purchase were sanctioned, the Gaslight Company would get a certain amount of capital, and would thus evade for a time the recommendations of Sir J. Rankin's Committee. The chief of these recommendations is the first—viz., the reduction of the initial price under the sliding-scale.

I think it will be necessary for you to explain to the Committee what the position of the South Metropolitan Company under the sliding-scale is?—In 1875 or 1876, the three Metropolitan Companies accepted the sliding-scale. The Commercial came under it in 1875, with an initial price of 3s. 9d., which was at that time their actual selling price. The Gaslight Company accepted it in 1876, also with an initial price of 3s. 9d., which was their selling price; and the South Metropolitan Company accepted it in the same year, with an initial price of 3s. 6d., their actual selling price being only 3s. They had all the same increment of dividend—namely, 5s. per cent. extra for each penny at which they sold gas below their respective prices. This was on their 10 per cent. capital.

In reply to further questions, witness said that lately the Gaslight and the South Metropolitan Companies had obtained Acts authorizing the conversion of their 10 per cent. capital to an equivalent amount of 4 per cent.—that was to say, £100 of 10 per cent. stock had been

converted into £250 of 4 per cent. stock. So that 4 per cent. was now the standard dividend; and the increments under the sliding-scale had been reduced in the same proportion. Instead of 5s. per cent. for each penny reduction, it was now 2s. per cent. When the sliding-scale was introduced, and for some years after, the proportions the sliding-scale gave were three-fourths to the consumers and one-fourth to the shareholders. This was an effective inducement to the Companies to reduce the price of gas. The sliding-scale had now a greatly diminished effect in that direction. The business had increased at a much greater ratio than the capital, or perhaps it would be better to say than the capital charges. The proportions, instead of 3 to 1, were now about 7 to 1. If the South Metropolitan Company could save £40,000 a year in their working expenses, £35,000 went to the consumers in the shape of a reduction of price, and only £5000 to the shareholders in increased dividend; consequently, the increases of dividend of late had been inappreciable. This point was put before Sir J. Rankin's Committee by the Comptroller or Accountant of the London County Council (Mr. Haward). They gave effect to it by recommending that the rate of increment of dividend should be increased by one-third concurrently with a reduction of the initial price. In short, they added at one end what they took off at the other. They reduced the dividend when the price of gas was high, and gave back the reduction when the price was brought to a low figure. Had they simply proposed a reduced initial price, without the additional increment, it would have been a breach of parliamentary faith, and unjust, because very large amounts of capital have been issued under the auction clauses—about £4,000,000 in London—with a parliamentary guarantee that at a certain initial price a certain dividend would be payable. Reducing the initial price, reduced the dividend. The public bought the stock at a high premium on these conditions. The initial prices of the three Companies of 3s. 9d., 3s. 9d., and 3s. 6d. per 1000 cubic feet, were to be reduced to the uniform figure of 3s. 3d. The Gaslight and the South Metropolitan Companies, with their converted 4 per cent. ordinary capital, and with increments of 2s. per cent. per penny reduction, were to have an additional 2s. per cent. for each 3d. reduction in the price of gas. The South Metropolitan Company, by their Act of last year, reduced their initial price from 3s. 6d. to 3s. 3d., for their then standard quality of gas.

Did the Company also adopt the Committee's recommendations in regard to the increment of dividend?—Yes; but in a slightly altered form. Instead of the extra 2s. per cent. for each complete 3d., it was shown to Mr. Oldroyd's Committee that it would be better to make it 8d. per cent. for each 1d. Therefore, in the Act, the 2s. per cent. is increased to 2s. 8d. per cent. per 1d. reduction below the initial price.

Witness then submitted to the Committee a table showing the effect of the altered initial price and scale of dividend under recommendation No. 1 of Sir J. Rankin's Committee as regarded the South Metropolitan Gas Company, and setting forth the selling price of gas ranging from 3s. 6d. to 1s. 9d., the dividends at the old initial price of 3s. 6d., with 2s. per cent. increments per 1d., and at the new initial price of 3s. 3d, with 2s. 8d. per cent. increments per 1d. This table showed that at all prices above 2s. 6d. per 1000 cubic feet the shareholders lost in dividend; that at 2s. 6d. they got exactly the same dividend under the new system as under the old; and that below 2s. 6d. they gained in dividend. The Company promoted a Bill last year voluntarily accepting the new scale; but their initial price was only reduced 3d. He then handed in a table showing the effect of various initial prices on the dividends of the Gaslight and Coke Company. Their present initial price was 3s. 9d., with 2s. per 1d. increments of dividends. The selling price of gas ranged downwards from 3s. 9d. to 1s. 9d.; and the dividends were set forth under the present initial price of 3s. 9d., under 3s. 6d. initial, under 3s. 5d. initial, under 3s. 4d. initial, and under 3s. 3d. initial. The effect of the table was that, with a reduction of 3d. in the initial price to 3s. 6d., the Company must reduce the selling price of their gas to 2s. 9d., if they would avoid loss of dividend; that, with a reduction of 4d. to 3s. 5d., the price of gas must come down to 2s. 5d. per 1000 cubic feet to avoid loss of dividend; that with the initial at 3s. 4d., the price of gas, to avoid loss, must be 2s. 1d.; and that, with the initial reduced to 3s. 3d., as recommended by Sir J. Rankin's Committee, gas must be sold at the impossible figure of 1s. 9d. per 1000 cubic feet to avoid loss. Sir J. Rankin's Committee hardly intended to penalize the Company in this way. The table showed what dividend would be payable under initial prices of 3s. 6d., 3s. 5d., 3s. 4d., and 3s. 3d. With a 3s. 6d. initial, the loss of dividend, at 3s. 5d. per 1000 cubic feet for gas, would be 5s. 4d. per cent., equal to 13s. 4d. per cent. on the stock prior to conversion; with a 3s. 5d. initial, the loss would be 8s., equal to £1; with a 3s. 4d. initial, the loss would be 10s. 8d., equal to £1 6s. 8d.; and with a 3s. 3d. initial, the loss would be 13s. 4d., equal to £1 13s. 4d. Witness could not but think these heavy reductions would be unfair. With a reduction of 3d. only to 3s. 6d. initial, the price of gas must come down to 2s. 9d. to avoid loss. Under the circumstances in which the Gaslight and Coke Company were now placed, 2s. 9d. would not be an unreasonable selling price. So that, when 2s. 9d. is reached, it seemed fair that the penalizing effect should cease. With a reduction of 4d. to a 3s. 5d. initial, the price of gas must come down to 2s. 5d. to avoid loss. Witness saw no possibility, in any reasonable time, of the Gaslight Company's price coming down to 2s. 5d. He therefore submitted that the reduction recommended by Sir J. Rankin's Committee would have a greater effect than they intended, or than would be just. This Committee, however, might determine what was fair. The South Metropolitan Company, by last year's Act, adopted the new scale of initial price and dividends; while the Gaslight Company did not adopt it or propose any modification thereof. He believed that Parliament would not allow the Gaslight Company to get additional capital in any way without a reduction of their initial price, and that, in fact, recommendation No. 2—namely, that for the transfer of the southern district—must be accompanied by a reduction of the Gaslight Company's initial price. He therefore suggested that one condition of the transfer should be a reduced initial price.

Lord R. CECIL: Are you prepared to meet the objection that, if this large sum of money were handed over to the Gaslight Company, they would be enabled to get out of the obligation imposed by Sir J. Rankin's Committee?

Witness: Whatever the amount of money may be which they will accept, they will not get it as free and independent capital at all. For instance, at their works in the southern district they make twice as much gas as they use in the south; and when these works are sold, they will have to provide some gas-making power elsewhere. A proportion of the £900,000 would therefore require to be expended for the purpose. We have the following draft clause prepared as a proviso to clause 3, which lays down conditions for the proposed transfer:—

Provided that no such agreement shall have effect until the standard price of the Gaslight and Coke Company shall have been reduced to 3s. 6d. per 1000 cubic feet for 16-candle gas, with a standard dividend of 4 per cent., and with a scale of increase or decrease of dividend of 2s. 8d. per cent. for every penny of decrease or increase of price below or above 3s. 6d., or until such other alteration or variation of the standard price and dividend of the Gaslight and Coke Company shall have been fixed as Parliament may think fit.

Mr. NEVILLE objected to this clause being sprung upon the Company which he represented. The Gaslight and Coke Company were not before the Committee at the present time.

Mr. LITTLER, on behalf of the City Corporation, also objected to this new clause.

The CHAIRMAN: We have had no notice of this new clause.

Mr. NEVILLE: Nobody has had notice of it.

Lord R. CECIL asked that the Committee should allow Mr. Livesey to explain what the clause was. This could do no harm; and if the clause were to be objected to, it could be done then. The most convenient course would be that they should explain what they were about to ask.

Mr. LITTLER strongly objected to the draft clause being discussed.

Mr. NEVILLE said the objection that he, on behalf of the Gaslight and Coke Company, had to the clause was that, if they discussed it now, they would be prejudging the question as to whether or not the recommendations of Sir J. Rankin's Committee were retrospective—that was to say, whether the first recommendation had reference to new capital, as they said, or whether it also referred to capital already raised, as Mr. Livesey appeared to think. They contended that it would be a monstrous injustice that it should apply to capital already raised. Their circumstances were entirely different from those of the South Metropolitan Company. They wanted to take the opinion of a Committee of Parliament on their own Bill, and they were only there with regard to the transfer of the Nine Elms area. The matter which had been raised was entirely outside the scope of the present Bill. Moreover, it had been sprung upon them without any opportunity of consulting their shareholders, or considering what the effect of the proposed clause would be.

Lord R. CECIL said the provision was a purely permissive one. It did not compel the Gaslight and Coke Company to sell, or the South Metropolitan Company to buy. All it did was to attempt to remove legislative obstacles which at present existed to the agreement for the sale of the Nine Elms district to the South Metropolitan Company being carried out. It could not possibly injure the Gaslight and Coke Company, because if they did not like the terms they were offered, all they had to say was that they did not choose to enter into the bargain. All the proviso did was to secure that, if the agreement were entered into, the capital thereby going to the Gaslight Company should be subject to the conditions imposed by Sir J. Rankin's Committee, or what they believed to be the meaning of the recommendations of that Committee. It did not make the agreement any more compulsory than it was. If the Gaslight Company did not take the capital on these terms, then they need not take it at all. They were bound to put this clause before the Committee, to secure that the public dangers which might be feared by certain members of Parliament did not result from the transaction.

Mr. LITTLER also rose to object to the proposed clause, when

The CHAIRMAN said the Committee were of opinion that it was better the South Metropolitan Company should give notice that they were prepared to bring in this clause. He thought this would be the fairest way. It had come on them rather unexpectedly. If they said that they were prepared to put in the clause, then Lord R. Cecil could offer an explanation with regard to it next day; and he could re-call Mr. Livesey to support it.

Lord R. CECIL intimated that he was quite willing to adopt this course.

Mr. LITTLER said this was a very serious matter for the consideration of the public authorities concerned, not only as public lighting authorities, but also as representing the consumers in the district. He should ask the Committee at present to say that they had nothing to do with the Gaslight and Coke Company.

Mr. NEVILLE submitted that this matter should be considered on the Bill of the Gaslight and Coke Company.

The CHAIRMAN: I do not think we can go quite so far as that.

Mr. NEVILLE said they objected to the proposal. The Gaslight and Coke Company were tied to the chariot-wheels of the South Metropolitan Company; and they wanted to get rid of this. They would much rather Parliament should put on them some abatement of the price of gas, than that it should be fixed without reference to them.

The CHAIRMAN thought it would be better to go on with the Bill.

Lord R. CECIL: There is another condition to the transfer of this district which is necessary?

Witness: Yes. I think this transfer will only be sanctioned under certain conditions, one of them being the price charged for public lighting. When the Gaslight Company absorbed in 1883 the late London Gas Company, who supplied gas on both sides of the river from the works on the south side, the Gaslight Company accepted as a condition of the amalgamation that they should never charge a higher price in the south than that charged for the time being by the South Metropolitan Company. This condition carried with it another—viz., that the public lights on the north side should be charged at the southern price. By the Metropolis Gas Act of 1860, it is enacted that the public lights shall be charged at the lowest rate paid by any private consumer. This compelled the Gaslight Company to reduce the price of public lights in the north to the southern price. I have a table giving the price of gas of the two Companies each year since the amalgamation of the London Company with the Gaslight Company, in 1883. When the amalgamation took place, the difference was only 2d. per 1000 cubic feet; it is now, allowing for meter-rent, about 8d. Thus the

public lights on the north side have been charged at a much lower rate than was ever expected. In the early days of gas lighting, the public lights were sometimes supplied at cost price, or even at a loss. This was done in order to get permission from the parochial authorities to lay pipes. The effect, however, was to make the private consumers pay for the loss on public lighting. The Act of 1860 put the matter on a just footing. It is said that the condition as to public lighting imposed at the time of the London amalgamation in 1883 saves the Local Authorities north of the Thames about £37,000 a year. It is true they pay this amount less than they ought to pay; but the deficiency is made up by an extra charge of about the same amount to private consumers. This is not fair. The Company, in short, charge a higher price to the private consumer than would otherwise be necessary. It is a case of robbing Peter, the private consumer, to pay Paul, the public consumer. The higher price thus charged reacts on the dividend under the sliding-scale. But even so, the private consumers bear about six-sevenths or seven-eighths of the loss. Even if the Company did take the £37,000, the shareholders could not get any part of it unless the price of gas was reduced, and then only one-seventh, or (say) £5000. The fair thing is undoubtedly to charge both classes of consumers equally, making perhaps a slight difference between large and small. Seeing, however, that the public authorities of the north have had the advantage so long, I am of opinion that they cannot be asked to give it up entirely. But a reasonable compromise may be made. I would suggest that it should be a condition of the transfer that the Gaslight Company shall never charge more than 2s. 8d.—the present price of the South Metropolitan Company—unless our Company should go higher than that figure.

Mr. LITTLER said it would be quite right for Parliament to impose conditions on the Gaslight and Coke Company in a Bill of their own. But what was proposed there was that another Company should impose conditions upon them, and that those conditions should affect the consumers in the district and the public authorities—and in a Bill with which they had nothing to do. This was a very serious matter; and he asked the Chairman to take the opinion of the authorities of the House as to whether such a thing had ever been heard of.

Lord R. CECIL said he should ask to have the Bill conducted in the ordinary way. The promoters should be allowed to say what they had to say.

The CHAIRMAN did not think they were out of order at present. The promoters had better go on as they had started; and at a later period they would hear Mr. Littler's suggestions.

Lord R. CECIL: Why should the transfer be made?

Witness: It is believed that the Powers of Charge Committee, after full inquiry, were unanimously of the opinion that the transfer is desirable, as being in the interest of the public and of both Companies. The public authorities have repeatedly stated that they consider the transfer desirable, provided their interest as to public lighting is properly safeguarded. The Gaslight and Coke Company sold last year 1,043,825,000 cubic feet of gas in their southern district at the South Metropolitan price. Taking the difference at the present figure at only 8d., this represents a loss to them of £35,000 in the year, which means that the consumers on the north side had to pay that amount more to make up the deficiency. This £35,000, and the £37,000 the private consumers on the north pay for the loss on public lighting, is sufficient to reduce the price 1d. per 1000 cubic feet in the north. The consumers on the north side feel this to be a great grievance, and make loud complaints on the subject. The South Metropolitan Company make gas cheaper than the Gaslight and Coke Company; and, if those works are transferred, they will, in a year or two, bring down the cost of manufacture to their average level, which will benefit the consumers. The western district of the South Metropolitan Company is growing rapidly. An additional works in that district will be a benefit to them. It will save a certain amount of extension at their great manufacturing station at Greenwich; and it will also avoid the necessity of laying a large additional trunk main from east to west. This would require a large outlay of capital, besides the inconvenience to the public. The Gaslight and Coke Company have made no agreement with the South Metropolitan about the transfer. They are probably unwilling to do so until they know the conditions under which the transfer will be permitted. I think it is time the matter was settled. My Company, therefore, ask for authority to purchase under fair conditions.

Mr. FORBES LANKESTER said he should like to know whether or not the clause as to cost for public lighting purported to be a clause agreed with the Gaslight and Coke Company.

Lord R. CECIL: No; certainly not.

Mr. FORBES LANKESTER said if the Gaslight and Coke Company were not consenting parties to the clause, the public authorities might find themselves in this difficulty—that, although the transfer went through on the strength of the clause, no protection would be got by it, since the Gaslight Company could say they were not parties to it.

Mr. RIGG said the proper way of proceeding would be to have the matter discussed with the Gaslight and Coke Company. If the Bill went through in its present shape, there would be nothing to bind the Gaslight and Coke Company; and the question of public lighting would not be settled at all.

Lord R. CECIL said the Bill merely proposed to give the Companies power to agree to transfer the district. If they did enter into such an agreement, they could only do so on certain conditions; and the matter of the clause would enter into the terms.

Mr. RIGG: The Gaslight and Coke Company would have power given them to enter into an agreement behind the backs of the local authorities, which would regulate the course of public lighting north of the Thames. If they did enter into the agreement, and the Bill went through, the cost of public lighting would be increased north of the Thames.

Friday, May 10.

The CHAIRMAN: When the Committee rose yesterday, I told Mr. Littler that I should consult the authorities of the House with regard to the point raised. I have done so; and I should like to hear if you have anything to say in connection with it. If not, I will point out what we propose to do.

Lord R. CECIL: I was about to make an application on a matter of procedure. I wish to ask the Committee not to deal in any way to-day with the transfer of the Nine Elms district. There are, as you know, in this Bill, two absolutely different proposals, having nothing to do with one another—one to raise capital for the general purposes of the Company, and the other to authorize an agreement entered into for the transfer of the districts south of the Thames belonging to the Gaslight and Coke Company to the South Metropolitan Gas Company. As to the first of these, there will be two questions raised by the London County Council—first, whether we are proposing to raise more capital than we shall require for the next five years; and, secondly, whether the alterations in the auction clauses that we propose should be admitted. These are questions of some importance which should be discussed; but they are altogether distinct from, and have nothing to do with, the question of the transfer of the district. My application is that the Committee should deal with these questions to-day, and leave the transfer of the district over till Monday. If we went on piecemeal with this question of the transfer of the district, and dealt to-day with the matter of public lamps, which is an important point, it would be very difficult to confine the inquiry strictly to that question, and not branch out into the question as to whether or not this agreement should be authorized at all. We should have to show, as part of our case for dealing with the public lamps, whether the transfer ought to be made, and whether there is any necessity for it. That opens the door to a discussion of the terms on which the transfer should be made. It would be difficult to confine the question of public lamps to that matter, and that matter only. It would be better to leave the transfer as a separate question, and deal with it on Monday. Counsel for the Gaslight and Coke Company will not, I think, offer any objection to this proposal.

The CHAIRMAN: You propose to deal with the question of capital to-day?

Mr. MUNROE: We shall be willing to accede to that; but, of course, it is understood that Mr. Livesey will be put in the box on Monday for cross-examination?

Lord R. CECIL: Yes.

Mr. ALLAN: We also are willing to accept the suggestion.

Mr. WILKINSON: We should deal with all the questions raised on behalf of the London County Council on Monday, as Mr. Livesey is to be re-called on that day.

The CHAIRMAN: I think we had better commence now on the lines indicated by Lord R. Cecil.

Mr. George Livesey, cross-examined by Mr. WILKINSON.

Mr. WILKINSON: We will go to the question of the alteration of the auction clauses. First of all, the auction clauses under the Standing Order are at the present moment applied to all gas companies in the kingdom.

Witness: Yes; since 1877.

Therefore, the auction clauses are in all Gas and Water Bills?—Yes.

You admit that your proposal would create a precedent?—Yes. After all these years' working, we have found that there are certain defects in the auction clauses.

You admitted in evidence that you do not mind giving the law as it stands a fair trial?—We have given it a fair trial.

I understood you to say that, in advertising an auction or in advertising for tenders, you only advertised in obscure papers, where the advertisement would not be likely to attract attention?—That is true.

The CHAIRMAN: What part of the Standing Orders of the House apply to the auction clauses.

Mr. WILKINSON: 188A. (To witness:) You wrote a letter to the "JOURNAL OF GAS LIGHTING" on Dec. 4 last.

Witness: Yes.

It was written with a view of showing that the auction clauses were not the best means of raising capital. You were very frank in saying that you did not want any tenders?—I have told everybody that. I have told Committees of this House, the London County Council, the Board of Trade, and the Chairman of Committees.

My suggestion is that you do not give the law as it stands a fair trial?—We did give it a fair trial for ten years; but we found that it was most unsatisfactory.

You have now given it over?—No; we comply with the spirit of the law in selling our stock to the greatest advantage. We comply with the letter of the law in advertising according to the requirement of the Act of Parliament.

I think you said that you do not comply with the spirit of the law?—That spirit is that the stock should be raised at the best price—that we should place our capital at the lowest possible rate. That we are doing. The letter of the law is that we should advertise in certain papers for a certain time. We do so. There is a disadvantage, however, in doing this, in this way: You have to advertise for four weeks. Well, in 1899 we advertised for four weeks, and in the meantime the market value had gone down very materially. In about six weeks from the beginning of the notice, we offered the stock to the consumers at a higher rate than the market price of the day. The consumers objected to pay more than the market price; and we met them in this way: As there was three months' interest accruing on the ordinary stock, we said: "You shall have it at the same as that." The six weeks' delay placed us in the difficulty that the market value had gone down, and we had some trouble in dealing with it. With regard to the letter, I am not ashamed of anything I have written. What I have written, I have written; and I stand by it.

Apparently you endeavour to evade the law by avoiding offering your stock by public auction or tender, and by not giving notice in the correct papers?—What are the "correct papers?"

You did not advertise the auction as publicly as you should have done. Then, you proceeded to issue stock at a fixed rate to the consumers and employees?—Yes, practically, as in the case of the London County Council and the Government.

The stock was taken by your consumers at a lower price than it should have been?—Yes; I can explain that. The issue of stock in November last year took place at a time when gas stock was at a considerable discount. Our market price was something under 128. We

consulted a stockbroker who deals very largely in gas stocks. He is a gentleman we can trust; and he advised us that we ought not to put the stock at a higher figure than 123. We put it at 122. It was necessary that we should place it, as we were in need of money. In the letter to which you have referred, I say that our experience of the sale shows that we should have got a rather higher price. This is the only case in which we have put the stock at below the market price; and it was done deliberately.

Your own system on that occasion was not the cheapest method?—Yes, it was. Stocks were being sold in the markets by auction at that time. In Brighton, for instance, stocks were being sold, and the reserve price was put at 140. The market price was 155; and yet they could not sell. Another company put the reserve price at par, and only half the amount of stock was sold. In our case, we did our best.

But you were not successful in obtaining the best price?—We were successful in our main object, which was to get the money. We should have had to be half-a-million of money in debt at our bank, if we had not got it. Anyone can be wise after the event.

You wish to issue stock at a fixed rate?—Yes.

You limit the area over which you offer the stock, do you not?—No. By sending round a circular stating exactly what is to be offered of £200,000 or more, a larger number of people will hear about the matter than if you advertised the stock in the newspapers; and certainly more people would know about it than you would be likely to get to attend an auction.

You offer it only to a limited number of people, by your method. By the ordinary plan, you would offer it to a larger number?—I may tell you that we have had greater experience in selling stock by auction than anyone else; and we did not find advertising successful. We tried it extensively, but did not find that we could place stock as well as by offering it to the consumers.

You are alone in that view, I think?—The Act of Parliament requires that we shall advertise this stock in the first instance for sale by auction or tender; and then, if not sold, the Company may offer it to their shareholders. Our shareholders did not care about it, as they could buy it in the market at the reserve price. We gave the go-by to our shareholders; and other companies will not do that. They say: "The law requires us to offer it to our shareholders; and we do it."

You put in your accounts a line "Unissued £459,000." That, I suppose, is a temporary overdraft?—Yes. But we have never had a loan from our bankers at this time before.

You have had accounts outstanding, and you overdraw from your bankers, repaying that overdraft, as a rule, in the summer?—For years past we have borrowed from our bankers in the winter; but we have always repaid it before this time.

This is a special case altogether?—Yes.

I suggest that the reason for it is the high price of coal at the present time, and the consequent high price of gas?—That is partially the cause.

When you have to pay overdrafts, you have, on the other side, large stores of coal on hand?—Not now. At this moment we have only two weeks' stock of coal on hand. We have 37,000 tons of coal in stock; and it gave us some little anxiety when the miners threatened to stop working in consequence of the coal tax.

I have your balance-sheet of Dec. 31 last?—Yes. You are speaking of the £240,000 we are in debt to our bankers; and I say that now that is the case we have only two weeks' stock of coal on hand. We have £200,000 less working capital than we ought to have.

As to the reserve fund, I see it was £133,000 on Dec. 31?—£70,000 was uninvested, and £63,000 was invested.

It is not your habit to invest the whole of your reserve fund?—It ought to be.

But is it?—For some years we have not done it; but we have never had so large a proportion uninvested as at the present time. The reason it is not invested is because the trustee securities stood so high in the market. They have dropped since; and when they dropped coal went up in price, and we were short of money.

Do you intend to invest that?—Certainly. I do not say we should invest right up to the hilt; but we should invest part of it.

What part of it?—We should have, perhaps, £10,000 uninvested, I think, though, strictly speaking, we ought to invest it all. We cannot invest it until we raise more capital. We have not the money.

As to capital expenditure, taking the last seven years the average is, I think, £131,000 per annum?—I think it better to take five years.

And that would be £136,000?—I dare say that is the amount.

In computing the amount you ought to be allowed, in accordance with the recommendations of Sir J. Rankin's Committee, I suppose about £140,000 a year would be the correct sum?—That is not enough; and I will tell you why. We have not spent so much capital in the last five years as we ought to have spent; and for this reason: We have six distinct manufacturing stations, five of which are old. All except the one at East Greenwich are old. We have, during the last five years, been largely increasing the gas-making power of these five old stations. We have increased it quite 30 per cent. or more. We have pulled down obsolete plant, and replaced it with modern plant which will make more gas. We have finished that. If we had not done this, we should have had to incur increased capital outlay at East Greenwich, which is our new station.

But would not £800,000 meet your views?—That is the amount I mentioned to the London County Council.

Would you not say it again?—It is too low.

When was your last application for capital?—In 1882.

I want to point out that there is a tendency, where gas companies come to Parliament for capital powers, to put the amount somewhat too high?—We came to Parliament in 1881, and again in 1882, and obtained additional powers. In 1882, we introduced something new. It has hitherto been the practice to allow borrowing powers to the extent of a quarter of the whole capital. We had power to raise £600,000 of new capital in 1881; and our borrowing powers would be £150,000. But in the Bill in which we did this, we said: "Our business can stand borrowing powers equal to one-third of the total capital that we get power to raise." In the Act of 1882, we obtained power to raise additional debenture stock to the extent of one-third of the amount of the capital we were raising; and it was that which carried us on. We were the first who introduced the system of getting cheap capital by increasing the debenture stock to one-third. I think the amount I mentioned to the London County Council—viz., £800,000—is too low. That would be £600,000 of ordinary stock and £200,000 of debenture. I should say we ought to have £660,000 of ordinary stock, and £220,000 of debenture, £880,000 in all.

Re-examined by Lord R. CECIL.

Witness said he had always sought to work the auction clauses fairly. He was anxious to work them out to their full extent; but they thought it to their advantage as a Company to make the consumers partners in every possible way. They were partners under the sliding-scale, and it was to the Company's interest to serve them well. If they could induce them to become shareholders, they made friends of them. Out of 8000 shareholders, 4000 were consumers, and 2000 employees.

Lord R. CECIL: You have introduced the system of profit-sharing?

Witness: Yes; but it does not go far enough. We have extended it so as to make the workmen shareholders. More than that, we have two workmen on the Board, and they have been on it for three years.

It is probably with the view of carrying this further, that you desire the modification of the auction clauses?—Yes. I regard this Company as a co-operative concern—shareholders, customers, and employees are all in the same boat, and have the same interests.

It is said that this will be a precedent. Do you think it will be a valuable improvement in the gas legislation of the country?—I think it will. I think it better that gas companies and their consumers should be friends, rather than live the cat-and-dog life they do.

And do you think this system will enable you to get more capital than you would otherwise secure?—Yes. Our last attempt did not enable us to get the market price; but if we put £120,000 on the market, it would not have been taken up.

And you would have had to offer it at a lower price?—Yes.

Is it a fact that you raise capital at the cheapest rate of any Gas Company in London?—Yes; we do.

Mr. TOMKINSON: What is the nature of your investments.

Witness: We invest a certain amount in Consols, and a good deal in such stock as that of the great towns. We place some in the debenture stock of railways. They are all first-class investments.

The CHAIRMAN: In your evidence-in-chief, you said, with regard to the question of the auction clause and tenders, that you had consulted the Board of Trade.

Witness: Yes. First of all, when the Bill came before the Chairman of Committees (the Earl of Morley) in the House of Lords, knowing that the Board of Trade were interested in the matter, I went especially to see Sir Courtenay Boyle; and he said: "I do not like an alteration of the auction clauses." But I explained the matter to him; and he said: "Leave the Bill with me"—that is a month ago—"if he has any objection to raise, I will send for you." He said he would confer with Lord Morley in the matter; and he gave me to understand that if Lord Morley raised no objection, he would not oppose our clause. He has not sent for me.

Then you conclude that the Board of Trade agree to the system of raising capital by direct offer?—Yes; they have raised no objection.

Lord R. CECIL: So far as this part is concerned, that will be the case for the Bill.

Mr. WILKINSON: Will the Committee hear me as to the auction clauses?

The CHAIRMAN said the Committee did not wish to go into that part of the case.

Mr. WILKINSON: It will be dealt with when you re-consider the Bill on Monday; and Mr. Freeman will be able to make a speech on the auction clauses.

The CHAIRMAN: He will speak on the whole Bill. We will continue the case on the whole Bill on Monday.

After some discussion, it was decided that the case for the London County Council on this part of the Bill should conclude at once.

Lord R. CECIL said he thought this was the course which should be adopted, as the auction clause part of the Bill did not stand or fall by the rest of the measure. He thought it would be convenient for the Council to produce their case against this part of the Bill; and then the Committee, if they thought right, could give their decision on it.

The CHAIRMAN said the Committee would not give a decision that day; but they would hear the case, as proposed.

Mr. WILKINSON then addressed the Committee for the London County Council. He said that, as Mr. Livesey had stated in his examination-in-chief, a proposal was made by the Company in 1896 to alter the auction clauses; and it was rejected by a Committee of the House of Commons. It would not be suggested, in face of the Standing Order, that a Committee had not power to raise this question of alteration. If they saw good reason to alter it, no doubt they had the power under Standing Order 188A. The points against any alteration were, shortly, these: First of all, this was the first Company who had ever brought the proposal before Parliament. The proposal was, if he might say so with respect, the pet scheme of Mr. Livesey, and Mr. Livesey alone. As a matter of fact, Mr. Livesey had never endeavoured to carry out the law. He had always been opposed to the auction clauses as they existed. He had always endeavoured, so far as he legally could, to avoid compliance with the clauses. The object of the Company, as the Committee would understand, was to raise capital as cheaply as possible. He (Mr. Wilkinson) submitted that there could not be a cheaper way than by public auction or tender, if the advertisements were properly put out beforehand. He must call the attention of the Committee to the report of Sir J. Rankin's Committee, which had been frequently referred to. They said in one part of the report that they had received no evidence to induce them to suggest an alteration of the auction clauses. Well, this Committee sat, he thought, 16 or 26 days, and produced a great volume of evidence, and they must have considered, among other things, the auction sales of stock in some detail; otherwise they would not have put the words he had read into the report. They had considered it; therefore the only person in favour of the course proposed was Mr. Livesey.

Mr. ROSTRON: This was never raised before the Committee in any shape or form.

Mr. WILKINSON said the Committee had the ways and means of raising capital before them; and they had deliberately stated what he had read. But even if it were right, an alteration of this kind should not be made in the Bill of a particular company, at the instance of a particular manager. If such an alteration were necessary, it was one which ought to have been applied to gas companies generally. The chief point in which Mr. Livesey's scheme broke down, was that when he offered his stock he offered it to a restricted number of people. It was as though the War Loan of the Government were issued solely to their supporters. Mr. Livesey issued his stock only to his shareholders and employees.

Lord R. CECIL: He offers it first to them at a fixed price.

The CHAIRMAN: He offered it at 122.

Lord R. CECIL: But the proposal before the Committee is that he shall offer it first to them.

Mr. WILKINSON said that his point was that, even if these people accepted the stock, a wider circle should have been given a chance to buy. He would leave the auction clauses there. As to the capital powers asked for, he was informed that, in the negotiations which took place on the amount of capital which the South Metropolitan Company should be allowed to raise, the London County Council had suggested that £500,000 would be sufficient.

Lord R. CECIL remarked that if the learned Counsel was going to call evidence, he was entitled to say what the Council suggested; but if he did not intend to call evidence to support him, he was clearly not entitled to say it.

Mr. WILKINSON said that, at any rate, the Council were prepared to say that the figure should be £800,000.

The CHAIRMAN: That is all we can get on with to-day?

Lord R. CECIL said he was afraid it was.

The Committee then adjourned till Monday (yesterday).

Halifax and the Gas Supply of Warley and Skircoat.—At a recent meeting of the Sowerby Bridge District Council, the Clerk (Mr. R. W. Evans) stated that he had received a letter from the Local Government Board, in which they stated that they proposed to sanction the agreement entered into between that Council and the Halifax Corporation for the purchase of the gas mains and undertaking of the Council within Warley and the rural portion of Skircoat, now comprised within the borough. With regard to the application of the money to be received from the Corporation, the Council considered that the proper course would be, subject to the sanction of the Board, to spend some portion of it in providing a new retort-house, or other works necessary, to pay off a portion of loans upon Warley and Skircoat, and use the balance for capital purposes. This did not seem to have commended itself to the Board. They said the money might be applied for the repayment of any loans raised for the gas undertaking. The Clerk had replied, pointing out what the Council wished, and suggesting that the wording should be made more elastic, so as to get the Board's sanction to spend the money as the Council proposed to the Inspector. The Clerk had had no reply. The application would now go before Parliament for confirmation. The Council would then have to go to the Local Government Board to see what had to be done with the money.

Marsden Gas Supply.—At the last meeting of the Marsden District Council, the Gas Manager (Mr. Arthur Halliwell) read his annual report. It showed that the quantity of gas manufactured during the year was 19,522,200 cubic feet, of which 14,949,400 cubic feet was for private consumption, 1,099,400 cubic feet for the public lamps, 939,600 cubic feet for stoves and engines, 633,000 cubic feet for prepayment meters, 254,700 cubic feet used on works, and 1,646,100 cubic feet unaccounted for—the latter representing a leakage of 8·4 per cent., against 9·4 per cent. in the previous year. Though the quantity of gas manufactured was 160,200 cubic feet less than before, the gas accounted for showed an increase of 147,600 cubic feet. The coal and cannel used was 1914 tons, from which 10,199 cubic feet of gas per ton had been produced. The average cost per ton of coal was 12s. 10d.; being 4s. 2d. per ton more than in the year 1899-1900, or equal to an extra cost of £400. The residuals and fittings had brought a return of 8s. 6d. per ton, or 2s. per ton more than before. The balance on the revenue account was £373 15s. 6d. The loan account now stood at £2150, with £370 11s. to the credit of the sinking fund; making the total liability £1779 9s. The number of consumers on the books was 515 using ordinary meters, and 88 using prepayment meters—a total of 603, and an increase of 55. The tender of Messrs. R. & J. Dempster, Limited, for annular condensers, was accepted

Driffield Gas-Works Extensions.—Last Thursday, a Local Government Board inquiry was held at Driffield into an application by the District Council for permission to obtain a loan of £5500 for the purpose of providing a new gasholder; estimated to cost £4000, and for otherwise improving the works, which were purchased three years ago at a cost of £22,500. The Clerk (Mr. Tonge) explained that for some time prior to January last, the Gas Committee had been advised by their Consulting Engineer (Mr. H. Tobey) that, in consequence of the increase of the daily consumption of gas in the winter months and the small storage, it was necessary to the more satisfactory working of the undertaking that a larger holder should be provided. This was fully supported by the fact that on Dec. 21 last the amount of gas made in 24 hours was 116,000 feet, and on other days nearly that quantity was produced; and the storage was only equal to 70,000 cubic feet. On Jan 30 last, the Gas Committee resolved that Mr. Tobey should prepare plans and estimates for the proposed holder, with all necessary appliances and mains, a bridge over the town beck, and the conversion of the present small holder (24,000 cubic feet) into a tar and liquor tank. This was approved, and the present application followed. The Council desired the loan for as long a time as possible, and Mr. Tonge suggested 40 years, which would entail an annual payment of £256 8s. 9d.; while a loan to be repaid in 30 years would increase the annual repayment to £297. The Inspector said he could make no promise on that point. The Local Government Board had a regulation as to repayments.

HOUSE OF COMMONS COMMITTEE.

Thursday, May 2.

(*Before Colonel* WELBY, *Chairman, Mr.* LLOYD MORGAN, *Mr.* PLUMMER, *and Mr.* SOARES.)

MOND GAS BILL.

The evidence in favour of the Bill (*ante*, pp. 1127, 1236) was completed to-day; and the case for the opponents was then opened.

Mr. FREEMAN, for the Birmingham Corporation, said the interest of Birmingham arose from the fact that the districts of Wednesbury, Darlaston, Handsworth, Perry Barr, and Halesowen rural, which were supplied with gas by them, were proposed to be incorporated in the sphere of the new Company. Birmingham had spent over £2,500,000 on their gas undertaking; and they felt bound to see that they were properly protected. They objected very strongly to the Bill, which was admittedly and avowedly a new departure in parliamentary legislation. This was the first time an effort had been made to obtain, in a wide district such as was now proposed, the right to supply a patented article. The promoters sought to secure a fictitious value for a particular patent, to force that patent on the district, and to obtain for a time an actual, and for the future a practical, monopoly, as regarded that patent. Dr. Mond was the very root and being of the Company. He (Counsel) should suggest that the patents upon which the Bill wholly rested were extremely dubious; that it was very uncertain whether the one chiefly relied on was a patent at all; and that the Company were now seeking to improve their position by obtaining parliamentary rights to supply in this large district, the result of which would be that, when the patents expired, Dr. Mond would have a well-established practical monopoly in the district—which was not for the public good. Those responsible for the Bill were not large owners of works or large owners of property in the district, but purely and simply a number of gentlemen representing Dr. Mond, who had nothing whatever to do with the district directly. If the Mond patent was such a useful thing as they were told, it was remarkable that the only large works which had applied it fully were those of Dr. Mond. The plant was expensive; but there was no reason why other large works should not have adopted it. Why should not the large works supply themselves? Such works could, and did already, obtain a satisfactory gas for ½d. or ¾d. per 1000 cubic feet; and if this was so, why should they go to a Company who would charge them 2d. for practically the same thing? The small works, too, could obtain coal gas (having regard to the ratio of heat in the two gases) at practically as low a price as Mond gas.

The CHAIRMAN pointed out that no works unless they took 4 million cubic feet a year were concerned in the Bill. He did not know where Counsel drew the line as to small works.

Mr. FREEMAN said the provision was simply that works taking less than 4 million cubic feet per annum could not "demand" a supply. There was nothing to prevent the Mond Company agreeing to supply people with a less quantity.

The CHAIRMAN: The Committee rather understood the promoters drew the line at 4 million cubic feet a year.

Mr. FREEMAN: They did so regarding the price they have to charge; but I am not aware they draw a line as to anything else.

Mr. LOW (Solicitor for the Bill): In the Bill there is an obligation to supply at a million cubic feet per quarter of thirteen weeks. There is no minimum supply; but my clients would be willing to take a clause limiting the minimum supply.

The CHAIRMAN: Do you suggest a minimum?

Mr. LOW: We suggest a minimum of 1 million cubic feet per annum—that we should not supply anybody who will not take this amount. Our object is that the smaller people shall have an option to take this gas, if they wish to do so. We do not want to be in a position not to supply the smaller people if they propose to take it.

Mr. FREEMAN: At what price?

Mr. LOW: The maximum price of 2d. per 1000 cubic feet.

Mr. FREEMAN said they talked of supplying at 2d. per 1000 cubic feet, but there was not a word of that in the Bill; the prices mentioned being 3d. and 4d. At 4d. per 1000 cubic feet, as the gas had only one-fourth the heating power of coal gas, the price was equal to 1s. 4d., which was about the price at which coal gas could be furnished by the existing suppliers. He would also draw attention to the extraordinary largeness of the area. The argument was that it was possible, from a few central stations, to distribute power to a great number of works over a large area. In Electric Power Bills, for instance, enormous areas were taken—hundreds of miles were served and worked from a very few stations, where power was distributed up to 25 miles from the different works. There was no such suggestion here. No one contended that Mond gas could be economically sent a great distance. Therefore, there were a number of these stations, having comparatively small radii round about.

The CHAIRMAN remarked that he understood they would be interlocked by mains.

Mr. FREEMAN said this was only a safeguard in case of a breakdown; it did not give them more power to serve the works in the immediate district. The scheme was an experiment; nobody had tried it on a large scale at all. The only cases in which producer gases had been used, were where it had been manufactured in the works themselves. In answer to questions, he had been told that the outside distance the gas was carried in Messrs. Brunner, Mond, and Co.'s own works, was less than a quarter-of-a-mile.

The CHAIRMAN: That is to the electric works, I think, three-quarters of a mile, and within the works a quarter-of-a-mile.

Mr. FREEMAN said what he would put was this: If it was desirable that the experiment should be made, why could not the Company have started with some reasonably small district, taking one of their stations? Sir F. Bramwell had said it was probable that they would start with one of these stations. Then why did they take this roving power over an area of about 125 miles? The scheme, he submitted, was an attempt to peg out a claim—to get their foot in a large district, and obtain power to supply this particular article in that district. Dr. Mond knew

perfectly well that, when he had obtained these powers, it would enormously facilitate the getting rid of the rights under his patent, which no one seemed anxious to get hold of; and he would secure a parliamentary protection which he had not been able to get in a Court of Law. It was a matter of surprise that Handsworth and Perry Barr should be included in the area. They did not contain any works likely to require Mond gas; but it was admitted that they would afford an opportunity of nestling up to Birmingham. As an experiment, it should not be tried on the scale suggested, and in the face of the various bodies who were entrusted with, and carrying out satisfactorily, the supply of gas in their districts. He should call a gentleman who had had very large experience of producer gases, who would tell the Committee that the estimates were wrong and unreliable, and that Mond gas was not as effective and desirable as a good many other producer gases which could be utilized. He should show by evidence that it was impossible for the Company to supply at anything like the rate stated, and that the cost of works and distribution was underestimated. Dr. Mond did not stand to lose; he stood to gain anyhow. He had his patent; and his one object was to persuade people to take it up. He then would get his royalties, but nobody else would benefit; and the Company, finding it impossible to carry out the scheme with profit, would come to Parliament and ask to be allowed to supply gas in competition with other companies. A monopoly would be created by the Bill, because the Company had either to pay Dr. Mond by shares, or, if they granted royalties for anybody else to use the gas, they had to pay him half of what they received. It was a huge experiment; and he asked Parliament not to grant the powers.

Mr. *Charles Hunt*, examined by Mr. LLOYD, said he had been since 1875 Gas Engineer to the Corporation of Birmingham, at the Windsor Street and Adderley Street works. He had charge of all the gas distributed within the Birmingham area—5500 million cubic feet per annum, distributed through 500 miles of mains. A large proportion of this gas was used for heating and motive power. The quantity consumed in the year ending March 31 was a little over 801 million cubic feet; and the number of gas-engines supplied was 2408. The Corporation had encouraged these uses of gas as far as possible; and the price had been reduced 11d. per 1000 cubic feet since 1875—being now 2s. 5d. This was an increase of 3d. on last year, in consequence of the greater cost of coal. Gas at 2s. per 1000 cubic feet produced a demand for gas-engines as against steam-engines. It would affect the price at which gas could be supplied for lighting, if they were deprived of their present consumption for power purposes. Each of the uses for which gas was supplied assisted in bringing down the price. Gas lighting was being revolutionized by the introduction of the Welsbach burner, which depended, not on the illuminating power, but upon the heating value of the gas. If gas companies were permitted to reduce the candle power, they would be able to supply at a much less price. Parliament had recognized this in the case of the South Metropolitan Gas Company, by permitting a reduction to 15, and then to 14 candle power. Mond gas, he understood, had a heating value of 150 British thermal units; that of Birmingham gas was 600 to 650, or from four to four-and-a-half times greater. It appeared to him that to distribute gas of such low heating value as the Mond gas would be very wasteful. Heat for heat, and under similar conditions, it would cost practically four times as much as Birmingham gas. From four to four-and-a-half times the volume would have to be distributed to produce the same effect. In the Birmingham case, the cost of distribution amounted to nearly 2d. per 1000 cubic feet sold, including wages and salaries, wear and tear, and meter repairs. This was not excessive. Gas in bulk could be distributed at a lower cost. If the Company had many customers of 1 million cubic feet per annum, he did not think their cost of distribution would be appreciably lower than that of Birmingham. A million cubic feet per annum worked out at about £9 a year; and he should say it did not look like a wholesale business to collect from £9 a year customers.

Mr. BAGGALLAY said the Company could not, by clause 38, which remained, be called upon to supply less than 4 million cubic feet per annum, and undertook not to supply less than 1 million cubic feet. There were two things as to price. The first was the maximum price, and the other the all-round price. He could not say whether the price would ever be in excess of 2d. It would depend on the quantity taken and the demand; but the maximum they could go to—for instance, if small consumers caused loss at 2d. or more—was 4d. per 1000 cubic feet. The dividing line between large and small consumers was 4 million cubic feet a year.

Examination continued: He thought the promoters' cost of distribution would be a little under the 2d. of Birmingham. The loss from leakage was a very important matter, having regard to the district being a mining one, and also to the pressure proposed. He understood that steel pipes were to be used, with a special joint; but some leakage would be unavoidable, which would be increased by the pressure. Ordinary gas was distributed in America under 10 or 20 lbs. pressure; and the cost of distributing under pressure was stated to be from ½d. to 1d. per 1000 cubic feet. In addition to distribution, there were rates and taxes, management, royalties, collection, and so on, to provide for. The Mond producing plant was a very costly apparatus—he thought unnecessarily costly, having regard to the result it produced. The Duff producer was a cheaper apparatus, and apparently attained precisely the same result. In regard to storage, he should say that gasholders to a certain extent would be required, if they were to supply gas through any large area with a number of consumers. This was an expensive item, for which no provision had been made. The position appeared to him to be that the Mond plant was too expensive to erect except in very large works; but the plant required for other producer gases was not so costly, and might be set up, and so large consumers would gain nothing by the present Bill. The Dowson plant was suitable for small consumers, and was already extensively used for power purposes. He thought it would be as advantageous as the scheme now before Parliament; and the same results might be achieved by the corporations or existing companies supplying coal gas mixed with water gas, by which the cost would be lessened. He failed to see any useful purpose, from a public point of view, to be served by the scheme.

Cross-examined by Mr. BAGGALLAY: They supplied their coal gas in Birmingham throughout the 24 hours. The consumption was not uniform; so that for the purposes of lighting it was essential to store gas. In regard to supply for power purposes, the demand fell off at meal times. He took it that the Mond producer was such that the make could be regulated to a greater extent than with the ordinary gas apparatus. Duff gas was a cold gas. As an engineer, he could see, from looking at the plant, that that required for Duff gas was less costly than that needed for Mond gas. The ½d. or 1d. cost of distributing under pressure in America (about 20 lbs. to the inch), was described as the operating cost—compressing, regulating, &c. It did make a difference in the cost of distribution. The amount of consumption in relation to the distance which the gas was sent through the main, did make a difference in the cost of distribution. It would materially affect the cost if the gas were distributed in enormous volume over 83 miles of mains, instead of 618 miles as in the case of Birmingham.

Friday, May 3.

Mr. *Hunt*, further cross-examined by Mr. BAGGALLAY, said the maximum supply of gas was taken in the evening; and this was known as the peak of the load.

Mr. BAGGALLAY: Can you tell me what ratio this maximum bears to the average output of the whole day, approximately?

Witness: Perhaps a fourth. The maximum supply extends over three hours.

If you had a steady manufacturing supply to give, instead of a supply for illuminating purposes only, and you had to give what was equivalent to twelve hours' supply at the maximum, your present mains would be furnishing about four times the quantity of gas they are supplying now?—If we had a steady supply equal to our maximum. This would have an effect upon the cost of distribution.

It would reduce the cost of distribution to about one-fourth what it is at present?—No. As regards the capital cost of distribution, you are right; but as regards the cost of meters, repairs, &c., there would be no reduction. I do not think it would appreciably affect the distribution charges, though it would affect the capital charge for mains.

If your costs of distribution are calculated at per 1000 cubic feet, surely if you sent four times the amount of gas through the same mains you must reduce the cost of distribution per 1000 feet to one-fourth?—No; I do not think so, because the cost of distribution is the cost of the maintenance of mains, inspection, and meter repairs. The more gas you have to measure, the larger must be the meter repairs.

The only item which would be increased is that of meter repairs?—Yes, that would be increased. The Birmingham figure for distribution is about 2d. per 1000 cubic feet; and there are between 70,000 and 80,000 consumers.

What would be the effect on your distribution charges, if you could supply all your gas to only 800 consumers—that is, one-hundredth of your present number?—It would reduce the distribution charges. These charges would largely depend, also, on the length of main. The salaries and wages would be reduced.

If your average consumption per customer is now 75,000 cubic feet, and you multiply this by 100, it would give you 7,500,000 feet per customer. Are you aware that this is only one-third of the 25,000,000 cubic feet which was the figure upon which the Mond Company's estimates were based?—That may be; but if you have large customers, it follows that they will be much more widely apart than ours. Therefore your mileage of mains will not be the same in proportion.

I admit this may have a bearing on the question; but equally you will admit that, if the total number of miles of main required to supply this large quantity is much less, that also has a bearing upon the question?—It would have a bearing.

If you had a twelve hours' supply, which is supposing you had the peak of the load flattened out over the twelve hours, instead of a three hours' supply, and you had only one customer for every hundred you have now, you could easily distribute your gas at less than ½d. per 1000 cubic feet?—No. I must ask you whether you assume that no gas will be sent out in the other hours. Our mains are acting for the whole 24 hours. You are putting upon me that the Mond mains will only act for twelve hours.

In each case, I suppose, there would be some consumption in the other hours?—We have a large consumption; I do not know yours.

But, taking the summer, you cannot have a large consumption between 4 a.m. and 4 p.m.?—We have a very considerable consumption during the whole year.

Represented by the supply which you are giving for power, not for lighting?—Not for lighting.

If you shorten your mains to 20 miles, instead of 600 miles (that is, to get the same volume through the mains per mile of main), would not this affect the cost of upkeep very much?—And use one large main for it?

Yes?—Very considerably.

Of course, upkeep of mains is a very large item in distribution charges?—It is a considerable item. With regard to leakage, there is no sinkage of the ground in Birmingham; but in the outside districts which the Birmingham Corporation supply with gas, there is. The total leakage of the Birmingham Corporation is about 6 per cent. In the outside districts of Wednesbury and Darlaston, which are undermined, the percentage would be 10 or 11 per cent. at least. I do not know that in many mining districts the leakage is very trifling. Most of the Birmingham leakage occurs in the smaller mains and the service-pipes.

Those smaller mains and services would not be present in the case of Mond gas distribution?—I do not know, because you are increasing the pressure enormously.

The pressure would affect the jointing of the pipes, would it not?—You want to take special care about the jointing, no doubt. The joints will be most vulnerable. I should have no difficulty in designing a joint to stand a pressure of 7 lbs., and to rest safely in ground liable to sink. The capital outlay of the Birmingham works is about £30 per customer; here it is estimated at £1000 per customer. The capital

per 1000 cubic feet of gas sold in Birmingham is 8s. 11d.; and I will accept it that with the Mond Company it will only be about 9d.

Are you aware that, to pay the interest at the same rate on capital as Birmingham are paying, only one-twelfth of the sum per 1000 cubic feet required by Birmingham would be needed by the Mond Company?—That is assuming you sell all you expect to sell.

So there is an enormous margin there?—There is a margin, no doubt, if your estimates prove to be correct. The number of engines taking gas from the Birmingham Corporation has largely increased the past two years; and the Corporation are at present to a great extent meeting the public demand for gas for power purposes. Mond gas at 2d. per 1000 cubic feet is equivalent to ordinary lighting gas at 8d.; so that if Mond gas is supplied at that figure, there will be a large saving—the price at which the Birmingham Corporation supply for power purposes being 2s. per 1000 cubic feet, less 5 per cent.

If the Mond promoters realize their anticipations, you will not suggest that they will not meet a great demand, and confer great benefit on the manufacturers of the district?—I do not know to what extent Mond gas is likely to be used.

Cross-examination continued: He did not think there would be a large demand for Mond gas, even at the low prices contemplated; but the Company would be likely to secure some of the Corporation's best customers. There would not be anything like the demand the promoters anticipated. He was informed by the Horseley Company, of Tipton, that the cost of Dowson gas was about 1½d. per 1000 cubic feet; and there were a great many installations of Dowson plant in the Birmingham district. He did not know that Mr. Dowson gave the cost as 2d. or 3d. Where the works were big enough to incur the cost of installing a Dowson plant, the manufacturers preferred to use Dowson gas rather than the Corporation gas. He agreed that the output of a Mond gas-producer, generating (say) at half its capacity, could be doubled very quickly indeed. This would be quite impossible in the case of ordinary coal-gas retorts. He knew of no instance in which illuminating gas was distributed without storage, though Mr. Shelton, in a paper read at the Paris Gas Congress last year, referred to a case in which it was distributed under pressure without a holder. In answer to an inquiry, witness was informed that the operating cost of compressing, regulating, &c., in this instance was from ½d. to 1d. per 1000 cubic feet. He assumed this did not include the cost of distribution. He did not know the volume of gas dealt with in that instance; but he thought it was a very small quantity. It might be that the compressing plant was only equal to 100,000 cubic feet per day, and that the pump was only working at one-fourth its capacity; so that he might be comparing the cost of extremely small plant with a scheme a thousand times greater. These, however, were the only figures available. He had never supplied coal gas for pumping or steel making; and he was not aware that it had been supplied to glass-furnaces or for burning bricks. He did not expect ever to supply illuminating gas for any of these purposes

Re-examined, witness said that, if an absolutely constant and regular demand for gas could be ensured, no storage would be required; but in the circumstances under which it could be supplied, he did not see how they could do without storage. He could not conceive how it was possible to supply all the gas the promoters expected to supply, by means of 83 miles of mains.

Mr. *E. Orford Smith*, Town Clerk of Birmingham, detailed the circumstances under which the gas concern supplying Birmingham and the surrounding districts was acquired by the Corporation in 1875. The outside authorities, excepting Wednesbury and Darlaston, had purchased their portions of the undertaking. Handsworth was a residential district; and they had an agreement under which they could practically purchase at any time. Asked what was the opinion of the Corporation with reference to the proposals of the Bill, witness said they thought it was essentially an experiment which ought to be tried over a limited area. They thought it was very hard that, having purchased the statutory rights to supply the district with gas, the Corporation should have a competing scheme brought in, until it was clearly proved that Mond gas could be distributed, and was suitable for the manufacturing purposes mentioned. In 1884, Sir F. Bramwell was asked by the Birmingham Corporation to report upon the advisability of allowing a Compressed Air Company to lay their mains in the city; and he was then, apparently, as favourable to the Compressed Air Company as he was now to the Mond Gas Company. Acting on Sir F. Bramwell's advice, the Compressed Air Company were allowed to operate in only a portion of the city; and if the same principles were applied here, and an experiment made in a convenient area, Birmingham would not object. The Compressed Air Company built works and laid down mains, but they utterly failed to distribute successfully; and this was what the Corporation feared would happen in the case of Mond gas. Birmingham, however, was subjected to the inconvenience of having the streets broken up to lay the pipes, and then, subsequently, broken up again for them to be removed; and they did not wish to have this experience repeated. No one could deny that producer gas was most useful in works where slack was a waste product. The granting of the powers now sought would create a practical monopoly, because the perpetual introduction of new schemes involving the laying of pipes all over a district would not be allowed. Handsworth and Perry Bar were rural districts; and apparently there was no object in including them in the area. He thought they were included because of their proximity to Birmingham.

Cross-examined by Mr. WALLACE: According to the advice he had received, it was extremely doubtful whether Mond gas would be distributed; but he agreed that the only way in which this question could be determined was by experiment. He suggested that experiments should be carried out by allowing the Company to extend in one direction only. It was a departure in legislation to give a large area in which the supplying Company need only deal with the large manufacturers of the district.

Mr. LLOYD MORGAN: So far as the Corporation are concerned, their objection is entirely based on the assumption that Mond gas will seriously compete with their gas undertaking.

Witness: Yes, and no. If it is a success, it will compete with the gas undertaking; and in that case, some form or other of producer gas will have to be considered by the Corporation. But I object entirely, if it is proved a success, to have the whole district broken up and possibly a better producer gas kept out. Though it is not proposed to break up the streets in Birmingham, it touches our mains in the outside districts. The Bill takes power to move, alter, and interfere generally with existing mains laid by statutory authorities.

Mr. *Dugald Clerk* said he had always been a supporter of producer gas. He had strongly advocated the use of ordinary coal gas at less than its usual illuminating strength for power and heating purposes. Mond gas was a weak producer gas. It was suitable for driving gas-engines within a works, but not for distribution over a district. The latter remark applied to all producer gases. So far as he knew, no scheme which attempted to distribute for power purposes so weak a gas as Mond gas, could succeed in practice. There was too small a margin of safety in the use of a producer gas for it to be distributed generally in a city. The heating power of Mond gas was rather less than that of Dowson gas. The inflammability of the two would be about the same. Mond gas possessed about one-fourth the heating power of the coal gas supplied by the Birmingham Corporation. It was made from slack, but not from all kinds. If a non-caking slack were not used, it would choke the apparatus. He understood the gas was to be distributed under a pressure of 7 lbs. This would require special mains and jointing, which would involve considerable expense. From a commercial point of view, he did not think Mond gas would be advantageous. A price of 2d. per 1000 cubic feet was much more than a manufacturer could afford. In his opinion, the expectations as to the great uses of this gas owing to its cheapness were mistaken. It could not be successfully applied for furnace work and boilers. Gas firing of steam-boilers had been attempted many times; but it had always failed, because of the initial loss of converting fuel into gas—a loss of about 30 per cent. With regard to the special furnaces used in the welding trade, Mond gas, according to Mr. Humphreys, provided a maximum temperature on combustion without a regenerator of 1100° C., which was not high enough for welding; so that the gas could not be supplied to such an industry as the flue-welding trade. It might be used by regeneration to get the temperature up to 1600° C.; but that would be too expensive. He knew of no gas-stoves to which this gas could be applied at present. In his view, the subject matter of the patents was exceedingly slight; and there was only one which he knew to be in use. That patent was not in any sense a fundamental one; it was a patent for a small improvement in detail. The patent described an invention which differed from Dr. Mond's early producers in only one thing, and that was that the mixture of steam and air was heated to a higher temperature than formerly. He thought if the Bill passed, authority and position would be given to the patents.

Cross-examined by Mr. WALLACE: None of the other producer gases gave sulphate of ammonia as a bye-product. His objection to the gas was that all engineers who had to do with the invention and designing of gas-engines disliked a weak gas. Such gas caused more trouble in getting the engines to work well and evenly. The reason of this was its feeble inflammability. The mixture of air with Mond gas to produce an explosion was not more simple than the mixture of air with coal gas. There was great difficulty in keeping the proportion of air constant. He could make an engine to run with this gas, and within a works he should not object to the gas; but he should not like a whole city to be supplied with it, having regard to the defects in the engines in common use. He agreed with Sir F. Bramwell that the gas-engine was the engine of the future; but he thought Sir F. Bramwell had very much underestimated the difficulties. If Mond gas was used for welding, it must have been by means of regenerating furnaces.

By Mr. MORGAN: Mond gas would not be suitable for making steam. He did not say it would not make clean steam, but that commercially it could not be applied to this purpose. It would not be economical to use it in a chemical works. He believed Lord Kelvin was quite wrong when he said that for making steel, and in chemical works of all kinds, Mond gas would be very economical as compared with coal. He also disagreed with Lord Kelvin as to its suitability for supply in a large district.

Mr. *Corbet Woodall*, examined by Mr FREEMAN, said he did not think the advantages of the scheme were such as to justify its application in a large area. For an undertaking which was admittedly experimental, the scale proposed was much beyond what was necessary. The object was directly or indirectly to establish a monopoly in the district. The testing of whether or not it would be pecuniarily successful did not depend on giving a very large area. It was not proposed to have one large generating station, but five; and one station for the purpose of experiment would be as sufficient as the five. Mond gas was very suitable for supplying in works, but not for distribution.

Mr. FREEMAN: Do you think it is such a gas as can be supplied to the consumer with advantage as compared with coal gas?

Witness: No. I think the capital expenditure proposed, especially upon the distribution plant, will prove to be too small. In my opinion, the quantity of gas to be delivered would require mains worth some £650,000, rather than the £361,000 which was given by the promoters' estimate. I am strongly of opinion it would be necessary to have some gasholder storage, in order not simply to equalize the supply, but to save the enormous amount of producer plant which would be necessary to keep pace with the fluctuating demand. Also, so far as I can see, no provision has been made for meters, which I assume would cost £200,000; whereas the total amount allowed for distribution is only £361,000. That is allowing one meter to each consumer.

If there was to be distribution over a large area, what sort of gas would you prefer?—For towns, at any rate, the gas supplied by the ordinary gas authorities I think meets the necessities fairly well. If the development of the use of gas for power increases—as it is doing very rapidly—and if the demand for light directly from the gas diminishes much more, it will be advisable to make a lower quality of gas (which could be made for about 1s. per 1000 cubic feet), and supply it for all purposes. That would have a calorific value about three times that of Mond gas, and would compare for most purposes advantageously with it.

Have you gone carefully into the estimates as to the cost at which this gas can be produced?—I have looked at one or two of the items. It is very difficult to check the estimate of the cost of the gas, because all the items are estimates and cannot be checked by fact. I was struck with one item. The proposed amount for general expenses, including salaries, rates, and taxes, is put down at £15,300. That is extremely low—I think about 5 per cent. upon the income. The rates only, in my opinion, will come to at least £15,000 per annum, and would consequently leave nothing for general expenses or salaries. I feel satisfied that the cost of distribution of this gas will be at least half that of distributing ordinary gas; and that would add on some £87,000 a year.

Has any provision been made for storage?—No. In my opinion, it is not correct to say this gas can be distributed without storage. With reference to the evidence of Mr. Jones (given the previous day), in regard to storage, I might point out that both the works to which he referred were connected with gasholders at a distance, which were available for equalizing the manufacture and distribution.

In your opinion, would there be a very considerable variation in the demand for gas for power?—There must be.

And that will be an element of uncertainty as to the profitable character of the work?—Yes.

And although under the Bill it is Mond gas which is principally to be distributed, there is nothing to prevent other gas being supplied so long as it is of the producer kind?—No. It does seem to me that where public distribution of this sort is proposed, there should be some definite limitations and regulations as to the composition of the gas—constant supply, pressure, and so on.

You think it undesirable in the public interest to authorize the distribution of so ill-defined an article?—I do.

Do you wish to say anything about the proposed minimum supply?—Since I wrote my notes that has been altered in the direction I suggested.

There has only been a suggestion made; there has been no definite agreement?—It has been altered to the extent, I understand, of putting the promoters under obligation to supply a million cubic feet per annum, instead of a million feet per quarter.

The CHAIRMAN: Not an obligation, I think.

Mr. FREEMAN: No.

Mr. WALLACE (in cross-examination): Have you had any experience of the distribution of gas at the pressure Mr. Mond proposes it should be distributed?

Witness: No; but I can make full allowances for the added quantity of gas the mains will carry at the higher pressure. Nobody has any experience in regard to the distribution of this or any kindred gas.

Has anybody had any experience of the kind of meters the Mond Company propose to use?—No.

The meters you have been talking about are such as you would use for the supply of gas for illuminating purposes?—Yes.

The £185,000 is a large sum you will admit. Do you know anything of proportional meters?—Yes.

If that was the kind of meter proposed to be used, your estimates would be very much reduced?—If a proportional meter were used, it would cost less; but whether it would be equally valuable, I am not prepared to say.

They cost £50 each?—That I am not prepared to say.

In the estimates, they have £50,000 for meters. Do you consider that would be sufficient?—No. I think with enormous volumes like this, some such arrangement would be almost necessary.

Mr. WALLACE, in reply to the Committee, said the £50,000 was included in the £361,000.

Witness said his estimate of £650,000 was for mains; the £185,000 for meters was in addition

Mr. WALLACE: I do not gather that you have any objection *per se* to the supply of gas of this description for power purposes?

Witness: I think the proposal is a very interesting one; and if it were limited to reasonable dimensions, personally I should very much like to see it tried.

Your belief is that if you reduce the illuminating power of the existing gas supply, you would arrive at something which would be approximately as good as Mond gas?—Yes.

If you did that, would you not largely increase the carbon monoxide in the gas?—Not more than is being supplied at the present time. Mond gas is a washed, but not a purified gas.

Have you made a study of the supply of gas without storage?—I have not.

You would not be prepared to disagree with others who have distributed this gas without storage? For instance, we have had an example of it being used at the electrical station near Winnington, and carried some distance?—I do not want to put my own opinion against those who have had practical experience, except to this extent—that I am not prepared to accept an illustration like that as a fair illustration of the system. An electric station supplied from Winnington, where the quantity of this gas made is enormous, might, it appears to me, be regulated so much more easily than from a factory supplying an extensive area with a large number of consumers. If you are to dispense with gasholders, you must have a plant so enormously large, in order to deal with the top make, that your load factor would be a very bad one.

But you can always bring on with producer furnaces of this kind an extra supply?—That is so.

So you need not run them all at high speed?—But you must have the producers to bring on, and you must have so many that the cost would be enormous. As to Mr. Jones's evidence of gas being sent out without storage, he said no illuminating gas undertaking could be worked without gasholders; and in two cases Mr. Jones referred to, there were gasholders in connection with the works.

Re-examined by Mr. FREEMAN: There was no case in which Mond gas was distributed, because hitherto it had only been used on the works where it was manufactured.

Mr. FREEMAN; Has there been an enormous application of late years of ordinary gas to heating?

Witness: Yes. The proportion of the total gas sent out by ordinary gas companies now, where the illuminating power is of no consequence and the heating value is everything, is from 50 up to 70 or 80 per cent. I know of a case of works in Denmark under my own care, where more than 70 per cent. of the gas is measured for purposes other than lighting. As this tendency grows, I think it will be to the advantage of gas companies to materially reduce the illuminating power of the gas, and consequently the price.

The CHAIRMAN: They will be able to do that without Act of Parliament.

Witness: That is so.

Mr. FREEMAN said that was the case for the Birmingham Corporation.

Tuesday, May 7.

Mr. WEDDERBURN, on behalf of the Corporation of Walsall, addressed the Committee. He said he agreed with the general statements of Mr. Freeman at the last sitting with regard to the opposition of Birmingham; and he now proposed to show the Committee why they should exclude from the operation of the Bill, if it passed in any form, the area of the Corporation of Walsall and the rural district of Walsall, in respect of which the Walsall Corporation was the gas-supplying authority. He appeared only for the Corporation; the Rural Authority not having petitioned because the Corporation of Walsall were the Gas Authority, and would therefore look after their interests. The Walsall Corporation also appeared as suppliers of electricity, but only within their borough. The area of the borough was the largest of any in the district—viz., 7358 acres—and the area of Walsall rural was 12,000 acres. The population of Walsall was 86,400; and the rateable value over £250,000. It was the most populous municipality after Wolverhampton in the county; and it had in its area 66 miles of public highways, and some 63 miles of sewers. It contained very few large manufactories; the chief trade being saddlery, which did not require any great calorific power, and for which Mond gas was absolutely unsuited. It was a trade the needs of which had been, and probably always would be, sufficiently met by ordinary gas and electricity. The town had two gas-works—one of 2½ acres and the other of 22½ acres—upon which, as they were situated in the centre of the town, the Corporation could set up works for the supply of any power agent which it might be to the advantage of the population to have. On the gas-works, including £120,000 authorized last year, the Corporation had spent £400,000; and they produced from them some 2000 million cubic feet of gas per annum. The price charged was 2s. 8d. per 1000 cubic feet; and they had some 70 miles of mains.

The CHAIRMAN: The Committee would like to know whether that 2s. 8d. is the normal price, or whether it has been abnormally raised by the rise in coal.

Mr. WEDDERBURN: It is higher than it has been; and we hope to reduce it if and when coal falls. I am told it has been reduced recently. The normal price would be less. Continuing, he said the Corporation proposed to supply electricity at 1¾d. per unit. They had spent some £50,000 on electrical works; and apart from tramways, they had only 13 miles of cable. The electric installation was just developing; and the question arose how far, by extending the Bill to Walsall, the Committee would check it. Walsall was on the edge of the area which the Company were asking the Committee to peg out for them; and therefore, if the Committee were to reduce, as he thought they must reduce, this gigantic area, one of the first places to come off would be Walsall, because it could be cut off without in any way affecting the rest of the area. The Walsall area was largely agricultural. It contained few collieries, and few or no factories which were likely to require Mond gas. The town was never consulted in the promotion of the Bill; and there was no inquiry with regard to its needs. The attitude of Walsall was not in the least obstructive to the use of Mond gas or of any other motive power. The real question Walsall desired to raise was not whether Mond gas was a good thing—which was not what any of the opponents could test—but whether the Bill proposed the right method, and the right occasion, for the compulsory introduction of it into the district. One matter, the importance of which it was impossible to exaggerate, was the control of the streets. He submitted that it was undesirable to take the control of the streets out of the hands of the Local Authority, who now had control of them, especially where the Local Authority had acquired complete control of their streets by buying up, from time to time, the gas concerns, and establishing their own tramways, electrical supply, &c. Here the borough had practically complete control of their streets; and the question was: Is it shown that the supply of Mond gas is so urgently needed by Walsall that this complete control ought to be invaded? He contended it was not. When the Lancashire Electric Power Bill was before Parliament, opposition was offered by various corporations in the middle of the area; and the promoters in that case said that, while the corporations might perhaps object, and while they (the promoters) ought not to be allowed to enter their districts to compete with them, yet they ought to be allowed to go through the districts of those corporations. That was a much stronger case than the present; but Parliament said that all the large towns—Manchester, Salford, Liverpool, Bootle, Stockport, and Bolton—should be excluded from the operation of the Bill. Why was Walsall not entitled to the same protection? Walsall, to get control of its streets, had had to purchase not one, but two gas companies; the result being that they already had four sets of gas-mains, and so experienced considerable difficulty in laying extra pipes. If this Bill were passed, what was there to prevent any other patentee coming forward and asking for the same privileges as were now sought by Dr. Mond? In the case of the Mond Company, the invasion of the streets would be especially marked, owing to the unusually large size of the pipes. He submitted that the principle of the Bill, so far as it was a Bill for the extension of a patent, was altogether bad; and the result, followed as it might be by equal claims by other people, was altogether dangerous. It had been urged that, in the case of the Lancashire Power Bill, the corporations were excluded on the ground of competition, and not of street control. That was not so. Partly, perhaps, they were excluded on the ground of competition. But far more were they excluded on the ground of street control; and that was shown by the fact that they were not only excluded as regarded supply, but also as regarded the passage of their mains through their several areas. Mr. Balfour Browne, in opening, said they wanted to supply the small

manufacturers; but Sir F. Bramwell, in his evidence, said they only wanted to supply the large ones. If 24-horse power was the limit, he would point out that there were only nine gas-engines of that power in the borough of Walsall. Not a single person had been called from Walsall to say he desired Mond gas, or that trade was hampered for want of some such power. If the Company only meant to supply large engines, there were only nine to supply; and if they meant to supply small engines, there would be unfair competition with the Corporation in the supply of gas. He did not understand the principle of there being any limit at all in the amount of gas the Company should be under obligation to supply. There was no certain indication that the Company meant to go to Walsall at all. They might never be wanted there; and if they were, it would not be for some years. Why should the Committee give the Company any advantage against Walsall? The Bill meant an unprecedented extension of a patent. If the Company did lay their mains in Walsall, and did a small business, it would in all probability result in that most undesirable thing, not really effective, but cutting, competition—just enough to make it necessary for the Corporation to raise their prices of gas and electricity to the smaller consumer, and possibly to levy a rate-in-aid. If—the Bill having passed—the Company did not go to Walsall, they would still retain the power to enter the town at any time; and twenty years hence they might say there was a good market there, and decide to enter into competition with the Corporation. Such a condition of things was absolutely unjustifiable and unjust. The fact that the Bill was introduced showed that there was no ground for extending the period of the patent. If the Bill were rejected, the Corporation, twelve years hence, would be able to supply themselves, and to do that far better, and far more cheaply, than the Company could. Would the Committee legalize, for the sake of this experimental product, perpetual interference with the streets of the town? The value of Mond gas was still far from certain. No one independent of the Mond Company had been called to say that they used it in their business, and had found it effective. Yet the Company wanted a practical monopoly in regard to the district—special rights in regard to it—before the thing had been given a fair trial. An unknown and secret product was put before the Committee; and they were asked to give to it special advantages. The claim as to cheapness was based on the assumption that slack was always going to be 6s. a ton. But that was altogether beside the mark; because slack, such as had been produced before the Committee, could not be bought for less than 12s. or 14s. a ton, and every 1s. a ton added one-eighth to the cost. If this gas were a good thing, and was not beaten by a new invention, the Walsall Corporation, who had always been up to date, were large enough and strong enough to supply themselves with it. On these grounds, Counsel asked the Committee, if they passed the Bill at all, to exclude from its scope the area of the Corporation and of the rural district of Walsall.

Mr. *Pearman Smith*, Mayor of Walsall, examined by Mr. MUNROE, gave evidence confirming Counsel's statement. He said the Corporation were the owners of the gas, electric light, and tramway undertakings; the only things laid in the streets over which the Corporation had not control being the water-mains and telegraph cables. There were only two consumers in Walsall, excepting the Corporation themselves, who were taking over a million cubic feet of ordinary coal gas. If the undertakers reduced their figure from four million to one million cubic feet, there would be sixty consumers whom they might supply. There were 184 gas-engines in use in the borough, of which 162 were under 12-horse power, and twenty between 12 and 36 horse power; the other two being over 40-horse power. The Corporation had been supplying gas at 2s. 9d. per 1000 cubic feet, subject to a 2½ per cent. discount. Formerly the price was 2s. 1d., the increase being due to the rise in the price of coal. It was hoped, however, that the present price would be reduced. The introduction of a 30-inch main to the streets of Walsall would be very objectionable; and he did not know where it would go—there were so many pipes and mains already in the streets. If the generating station were placed at Darlaston, as was proposed, the gas, to get to the extremity of Walsall, would have to be conveyed some 3 or 4 miles. In the first mile there was only one works, and in the second mile about six or seven. He did not think they would be likely to take this gas. The trade of the town was in the hands of many, not of a few; and therefore the demand would be for small quantities of power, which the Company would not supply. The larger factories had installations of Dowson gas, which they used for annealing purposes. Even assuming that the gas was suitable for the trades of the town, the length of main required to distribute it would kill the price. The calculations as to profit of the promoters were based on the price of slack being 6s.; but such slack as had been produced before the Committee cost from 14s. to 15s. a ton. According to the tenders sent in to the Corporation, the average price of slack during the last two years had been 12s. 4½d. per ton. There were no pottery works in the borough; and there were only two works which could be described as iron-works. There were no steel-works, and no glass-works. As regarded the supply of Mond gas to the coal mines, he pointed out that they had slack on the premises, so to speak; and that therefore it would be more profitable to them to make their own producer gas, if they needed it, than purchase it ready made,

Cross-examined by Mr. WALLACE: The Corporation had received a petition signed by 25 important manufacturers in the district; but they represented a particular class—chiefly the hardware trade. That petition had reference to the terms upon which the Corporation should take the gas. In the course of the negotiations, the Committee of the Corporation did suggest that the gas should be supplied in bulk at the boundary of the borough.

Mr. WALLACE: You object to your streets being interfered with by anybody but yourselves?

Witness: We do, very strongly.

The telegraph and telephone people have power to break up your streets?—Yes.

Have the Water Company power to break up the streets?—Yes.

So that three very important users of the streets for the convenience of the inhabitants have power to break them up?—And we strenuously oppose having another.

In further cross-examination, Counsel put it to witness that the slack exhibited to the Committee was bought from the Earl of Dudley; and he produced an invoice showing that the price was 5s. 3d. a ton. Witness replied that the slack he saw appeared to be what was known as bakers' nuts; and for that they would have to pay to-day 14s. to 15s. a ton.

Mr. WALLACE: But when you saw it the big lumps had come to the top?

Witness: I did not see the bottom of it.

Further cross-examined: The Corporation could supply Mond gas if it were desired, having plenty of room for the necessary plant at one of their existing gas-stations in the middle of the borough, which was 22½ acres in extent. He agreed, however, that to do so they would have to break up the streets, and, further, that they would have to obtain the sanction of Parliament. He had no reason to suppose that the supply of this gas would increase the trade of the district.

Re-examined by Mr. MUNROE: Not one of the gentlemen who signed the petition had been called by the promoters in support of their Bill. It appeared from the petition that the signatories were afraid that the Corporation would take their supply of gas in bulk from the Company, and thus produce a middle-man. These signatories were situated over some 6 miles in the district. The fathers of the petition were the promoters of the Bill. Ordinary gas had been supplied in Walsall at as low a figure as 1s. 11d.

In reply to Mr. MORGAN, who asked whether the Corporation agreed not to oppose the Bill provided they were supplied in bulk, witness said the Corporation had always stated that they would oppose the Bill; they felt that this was quite an experiment.

Mr. *John Cooper*, Town Clerk of the Borough of Walsall, said he conducted the negotiations with the promoting Company. These negotiations took place wholly upon the basis of the gas being brought to the boundary of Walsall to be supplied in bulk to the Corporation if, and when, they desired it. Therefore, for all practical purposes, there was exclusion, except at the Corporation's pleasure. If as years went on it was shown that the experiment was a success, the Corporation would have been able to take the gas. The negotiations were entered upon mainly to avoid the cost of parliamentary opposition to the Bill.

Cross-examined: If the promoters had proved that the supply of Mond gas could be made a commercial success, he thought the Corporation would have been willing to approach them with a view to obtaining a supply in bulk, so that the Corporation themselves might lay the necessary mains, and supply the gas to consumers within their boundaries.

Mr. PLUMMER: You wished then to take the risk, and you would reap the result?

Witness: Yes.

Mr. *B. W. Smith*, Gas Engineer to the Borough of Walsall, said he was well acquainted with the various systems of manufacturing producer gas. The capacity of the Corporation gas-works was about 2 million cubic feet per day; and when the works were complete, the daily output would be about double. Already about 70 miles of mains had been laid. Last year 41,754,200 cubic feet of gas, or 9¼ per cent. of the whole annual manufacture, was supplied for power purposes. He did not think the promoters could supply Mond gas, except with a generating station in Walsall, having regard to the cost of distribution. Storage power would be required. The streets of the town were already very crowded with pipes and mains; and he had recently experienced considerable difficulty in laying a 12 inch main, owing to the congested condition of the roads. The cost of distributing Mond gas in the district would be not less than 2d. per 1000 cubic feet. It would cost about £4400 per mile to lay a 30-inch cast-iron main from the generating station at Darlaston. Continuing, he said there was a large quantity of ashes in the district, which caused oxidation of the pipes. There had been serious subsidences; and on the north of Walsall the road had sunk as much as 5 feet—that was after a pipe had been laid. This necessitated continual watching in that part of the road. There was nothing larger than a 6-inch pipe. He had no doubt that, if Mond gas turned out to be a success, in years to come the Corporation could, after the patent had expired, supply in the way now proposed. In all probability, further improvements would take place; and when these improvements did take place, and it became a commercial success, they had sufficient ground on their present works to supply the gas, if they obtained power to do so. He noticed that, according to the map of the district which was hung upon the wall of the Committee Room, in the borough of Walsall there were fifteen collieries, and in the rural district of Walsall eleven collieries. This was somewhat misleading, because there were only five collieries in the rural district and two in the borough. A number of those marked on the map represented collieries which were practically extinct, or which had been abandoned because they were worked out. Iron-works and foundries were also marked on the map indiscriminately, and without regard to whether they were large or small. He did not think many of them would ever take as much as a million cubic feet of gas per annum.

Cross-examined: He based his estimate of 2d. as the cost of distributing the gas on the number of consumers the Company proposed to serve on the million cubic feet minimum. He considered the proposed pressure of 7 lbs. excessive. He agreed that in water-pipes the pressure was sometimes 60 lbs., and even as much as 240 lbs.; but that was a very different matter. He thought Mond gas came in the same category as all producer gases. It was only a small matter that sulphate of ammonia was produced in the manufacture, and that bituminous coal was used. As to the storage, he had not gone into the actual cost and the size of the holders which would be required; but he held that the Company would be unable to supply without storage.

Mr. *Alexander Wyllie*, Electrical Engineer to the Corporation of Walsall, said that at present the Corporation had about 13 miles of electrical cable in the borough, part of which was in connection with the tramway undertaking. At the generating station, they had five generators and machinery of nearly 1000 indicated horse power. The generators were driven by steam. A discussion occurred with regard to the use of producer gas, owing to the high price of coal; and in consequence he investigated the matter. Having made a careful

comparison with the cost of production at the Northwich works, where Mond gas was used, he came to the conclusion that there would be no advantage in the Corporation adopting it. He did not know of any supply works of substantial size that were driven by gas power. Up to 300 or 400 horse power, producer gas might be used advantageously in an electric station. Where large power was used, if steam-engines were anything like economical, manufacturers would be very reluctant to replace them by gas-engines. For the economical distribution of power in large works, such as those referred to by the promoters, he was strongly of opinion that an electric installation was the one that would prove most economical. For very small powers, electric motors were found most economical in his district. Most of the manufacturers were in a small way—being saddlery manufacturers, or manufacturers of bits and buckles and so forth. At the end of 1899, they decided to adopt a moderately low rate for motors; and it had been fairly successful. They charged on the maximum demand system. The average came out at something under 1¾d. per unit, which was found to be very economical for small powers, although they supplied works which required 20-horse power. Asked whether if there was competition with Mond gas *pro tanto* there would be no reduction, witness said they hoped to have a fair chance to supply manufacturers at a low rate, and they would be sorry if competition prevented them from getting some of the larger consumers. In the smaller trades, he had no hesitation in saying that, as a rule, electric motors were the most suitable. Very often a manufacturer required power at two or three points; and he could put two or three motors down much more conveniently than having gas-engines at one point.

Mr. WALLACE (in cross-examination): The price at which you supply your motor power is 1¾d. per unit?

Witness: Yes; slightly under.

That is equivalent to £47 per horse power per annum, working continuously?—Yes.

How much does Mond gas work out to—£4 7s. 7d.?—Yes; but for perfectly continuous work, which is unknown in practice.

Mr. *J. Emerson Dowson*, examined by Mr. MUNROE, said he had no practical acquaintance with Mond gas, but was familiar with producer gases generally.

Mr. MUNROE: Do you think that this scheme for producing the gas at various points, and then distributing it at long distances (say, 6 miles), is one which would commercially pay, or is a practical scheme?

Witness: I have considered this in connection with the gas made in my own apparatus, and I really do not think it would.

Suppose you make producer gas at Darlaston, do you think it would be practicable, from a commercial point of view, to bring it by a 2 ft. 6 in. main to the Walsall area?—The size and cost of the main are very important. I take it that is dependent upon what cousumers you can get in a district in relation to the length of main.

In further examination, witness said he should say it was rather a delusion to suppose that Mond gas could be used for boilers and furnaces. For large furnace works, gas could be made in anyone's producer with ordinary slack coal. He had designed and superintended many gas-fire furnaces; and he had had to consider the question of where the gas producer should be placed in relation to the furnaces, to get the most economical and best results. He felt sure that the right thing to do was to have the producers fairly near the furnaces where the gas was to be used.

Mr. MUNROE: What do you mean by fairly near?

Witness: Say, 100 feet. I will give you my reason: The economical way of heating a furnace is to take the gas to it hot from the producer. If you make the gas far away and bring it in a long pipe, you cool the gas and lose a certain amount of heat. Therefore I have never attempted to do that.

The longer the distance the more heat you lose?—Precisely.

The CHAIRMAN: Is yours a hot gas?

Witness: All these gases are hot when they leave the producer.

In further examination, witness said that if a gas were cooled and washed after it had left the producer, as was done with the Mond plant, some of the tarry vapours, which were valuable as heating constituents, would be removed; whereas, if the gas were conducted in a hot state straight to the furnace, the tarry vapours would be burnt, and would add to the heating power of the gas. He thought it would be a fatal thing for a manufacturer to attempt to heat a large furnace with gas which cost 2d. per 1000 feet, which was said to be the probable price of this gas. He would give an instance of the actual cost. Working with a moderate sized generator, which converted only 2 cwt. of coal in the hour, and which produced 21,000 feet of gas per hour, the actual cost of the gas, including fuel, wages, and repairs, was about ¾d. per 1000 cubic feet—the coal costing 6s. per ton. With coal at 9s. per ton, the gas would cost about 1d. per 1000 feet. The 1d. contrasted with the 2d. of the Mond gas; and that was working on a small scale. One man would still be able to work a larger sized producer; and his wages being spread over the larger production, it would be found that, with a generator of double the size of the one described, the cost of the gas, with coal at 9s. per ton, would be ⅝d., inclusive of fuel, wages, and repairs. It was essential to clean the gas for power purposes—removing any tarry constituents. If the gas could be delivered at 2d. per 1000 feet, it would in many cases be an advantage; but, of course, the position of the consumers had to be considered, and the length of main necessary to supply them, as to whether it would be economical. If the gas were limited to supply for power purposes, it would pay the promoters to bring it, as in the case of Walsall, six miles, or something between one and six miles; but if there were, as he had heard, few consumers, he did not see how it could pay. He hardly considered it, from a commercial point of view, a practical thing.

Cross-examined by Mr. BALFOUR BROWNE: He had no practical experience of Mond gas; but he had had many years' experience of producers of his own kind, and naturally had studied many other producers in the main. The largest distribution of producer gas with which he had been connected was in Holland. The gas there was taken about ¼ mile, and there was no difficulty. He took it to be a question of expense largely, provided the pipes were made to suit the ground, and so forth. His gas was made from anthracite and coke.

This closed the case on behalf of Walsall.

LEGAL INTELLIGENCE.

White v. Bristol Gas Company.

The appeal in this case, in which the defendants were made liable for damages for personal injuries caused by an explosion of gas (see *ante*, p. 627), came before the Master of the Rolls and Lord Justice Romer yesterday, and was dismissed, with costs. Our report is unavoidably held over.

Nuisance Caused by Electric Light Works.

In the Chancery Division of the High Court of Justice recently, Mr. Justice Buckley gave judgment in a case which had occupied him for several days. It was an application by one Hawkes for an injunction to restrain the Leyton Urban District Council from carrying on their works in connection with electric lighting in such a way as to cause a nuisance by noise and vibration. In February last year his Lordship granted an injunction, but suspended it till over April 9, 1900, on a certain undertaking which was given by the defendants; and on that day a further suspension was granted on a further undertaking being given. The defendants appealed, but the Court of Appeal affirmed Mr. Justice Buckley's judgment—confining the injunction, however, to noise and vibration caused by the use of gas-engines. The plaintiff contended that the defendants had departed from their undertakings and also disobeyed the injunction; and he now applied for a writ of sequestration against the defendants for contempt of Court. There were nearly a hundred witnesses on the two sides. In delivering judgment, his Lordship said he did not intend to proceed on the departure from the undertakings, but should only deal with the breaches of the injunction. He could not, however, pass over the undertakings without notice, inasmuch as it was admitted in the evidence that the defendants had wilfully broken them. His Lordship then dealt with the evidence at length, commenting severely on that of some of the witnesses. In the result, he held that the noise and vibration which at the trial had been found to exist were allowed to continue after the injunction had been granted.

The defendants appealed, and the case was under consideration from the 6th to the 8th inst. In the result, Lords Justices Collins and Stirling held that there had been a breach of the injunction, and that the writ must go. It could, however, lie in the office for a week, to enable defendants to apply to Mr. Justice Buckley for any indulgence to which they might think themselves entitled.

An Acetylene Gas Supply Case.

His Honour Judge Greenwell, at the Newcastle-on-Tyne County Court, on Wednesday week, had before him a case in which the Dargue Acetylene Gas Company sued an innkeeper, named Wood, of Cleveland, for some £30, the cost of an acetylene gas installation. Defendant repudiated the debt on the ground that Mr. W. H. Dargue, the Managing Director of the plaintiff Company, induced him to enter into the contract by misrepresentation. He said Mr. Dargue represented that the cost of acetylene would compare with coal gas at 2s. 9d. per 1000 cubic feet. As he was paying 4s. 3d. for coal gas, he expected that he would save 1s. 6d. by the change, and therefore ordered the installation. He found, however, that the new gas cost more than the coal gas. Mr. Dargue said his estimate of 2s. 9d. was correct, as compared with coal gas, light for light. Acetylene as an illuminant, candle power for candle power, was a cheaper gas than the poor coal gas supplied to the general run of country places. Mr. Wood complained in one of his letters as to the poorness of the coal gas. His Honour said it was a question of the cost, light for light; and he saw no misrepresentation of fact. Judgment would be for the plaintiffs.

Traction-Engines and Gas-Mains.

At the Bradford County Court last Thursday, his Honour Judge Bompas, K.C., gave judgment in an action brought by the Clayton, Allerton, and Thornton Gas Company, against Messrs. A. & S. Cook, building contractors, of Armley. The claim was for damage alleged to have been done to the mains of the Company by the passing of a heavy traction engine and boiler belonging to the defendants over the highway to Clayton. His Honour said that, in the absence of authority showing the defendants to be liable in such a case for the damage done, he would have to give judgment for the defendants. The point, however, was one of importance; and he granted leave to appeal.

Unlawfully Disconnecting a Gas-Meter.

At the West Ham Police Court recently, before Mr. E. Baggallay, George A. Carpenter, a coffee-shop keeper, of Connaught Road, Silvertown, was summoned by the Gaslight and Coke Company on the ground that he, being a consumer of their gas, had disconnected the meter from the main without giving 24 hours' notice. Mr. Humphreys, who prosecuted, said that on the 12th of March the record of the defendant's consumption showed an average of 79 cubic feet a day for the month. Next day, when the index was taken, it was shown that 550 cubic feet had been burned during the previous day. This could not be credited by the Company's officials, and on the 22nd. a further examination of the meter was made, this showing a consumption for the nine days of about 166 cubic feet. On the 27th, Thomas Collins, a collector, called and asked to see the meter, when defendant said the window-board, under which the meter was, had collapsed, and the collector must wait. He afterwards asked the officials to call again; but when they said they would wait, he got on to the window-board, and called his wife. He put his hands into the cavity where the meter was, but what he did could not be seen, for his wife stood between him and the officials. Suddenly Collins heard a rush of gas, which filled the window, and as he pushed past the woman she left the shop. Collins found the inlet cock on the Company's main turned full on, and the fancock, in addition to the union, detached from the meter. Defendant

then suggested that he had touched the cock accidentally. The collector was called to bear out this statement, and added that the next day defendant said he had disconnected the meter the previous day as there was an escape, and he had had to burn lamps. Defendant was sworn, and said that the day before the officials called he noticed an escape of gas, and to avoid the possibility of an accident he had detached the meter. Mr. Baggallay: You may think yourself lucky that you are not charged with larceny. There is no doubt this was done for the purpose of stealing gas. It was quite obvious what it was done for. You must pay 40s., and £3 3s. costs.

Are Experts' Reports Confidential?

At the Westminster Police Court, a few days ago, before his Honour Judge Lumley Smith, K.C., Mr. Arthur Clark, a sanitary and hot-water engineer, sought to recover damages from Mr. J. W. Dibdin, of Messrs. Dibdin and Thudichum, analytical chemists, of Westminster, for the loss of the use of a report made by Mr. Dibdin upon a certain gas-burner, for which plaintiff paid him a fee of two guineas, and also 10s. 6d. for testing expenses. When plaintiff received the report, he returned it to Mr. Dibdin to have one of the columns of the tests—the one relating to the duty of the burner—taken away. Thereupon Mr. Dibdin wrote across the corner of the report the words "not for publication," and sent it back to the plaintiff. This, it was alleged, had destroyed its value to him. The report was asked for at the time the proposal was brought forward to reduce the illuminating power of London gas from 16 to 14 candles. Plaintiff said that he wanted the report to do as he pleased with it; and he did not require the calculations relating to the candle power of gas. For the defence, it was contended that the author of a report had a perfect right to do as had been done in this case. Mr. Dibdin said in the whole course of his experience he had never, on any consideration, given a report for publication. He was asked to make his report for 16-candle gas, and leave it open for 17-candle. He believed the report, as plaintiff wanted it, would have been misleading to the public. Evidence having been given as to the custom of the profession in this matter, which bore out Mr. Dibdin's statement, his Honour said he was not sure that the defendant was justified in writing the words of which complaint had been made. If the report had been sent back under a covering letter stating "Please take note that this is not for publication," defendant would have been within his rights. The report, however, had been paid for by, and delivered to, the plaintiff; and it was thus his property. He returned it for a special purpose; and his request was not acceded to. Judgment would be for the plaintiff—for a farthing.

Leaving Work Without Notice.

At the Leigh Police Court, on Monday last week, John M'Hugh, John Grime, James Mannion, Michael Flaherty, Mark Whitehead, and Thomas Hughes were charged, under section 4 of the Conspiracy and Protection of Property Act, 1875, "that they, being on the 22nd of April in the employ of the Tyldesley Urban District Council at the gas-works, did wilfully and maliciously break their contract of service with the Council, knowing or having reasonable cause to believe that the probable consequences would be to deprive the inhabitants of Tyldesley wholly or partly of the supply of gas." The case against M'Hugh and Grime was taken first. Mr. E. Brierley appeared for the Council; the defendants were represented by Mr. Bryan. Mr. Brierley said before April Charles Austen had been the Manager of the Tyldesley Gas-Works, and another man named Joseph Shepherd had charge of the distributing department. The Council came to the conclusion that it would be best to have a General Manager, and accordingly Mr. Gendall was appointed, and entered upon his duties on the 1st of April. Mr. Austen did not appear to be pleased with the arrangement, and about three o'clock on the afternoon of the 22nd some friction took place, and Mr. Gendall dismissed him. Austen then went into the retort-house, where M'Hugh and Grime were working, and shortly afterwards Mr. Gendall found all three had left the premises, and he had no one else to assist him. The production of gas was, of course, stopped. About seven o'clock he went to put on the pressure, and found that a valve in the hydraulic main was open, and that air was entering the gasholder. The consequence was that the gas was rendered non-luminous; and that night the town and the railway station at Tyldesley were in darkness, and the theatre had to be closed. The town was also in darkness on the following night. Evidence to this effect was given; and Mr. Adderley, the Station Master, added that, in order to light the station, he had to get as many lamps as he could, and even then the state of things was dangerous. The defence was that it had been the custom at the gas-works neither to give nor take notice. The men left or were dismissed at a moment's warning. Austen engaged the men and paid them, and the men were not supposed to know that Mr. Gendall was Manager. M'Hugh said he had been a stoker for five years on and off at the works, and had left twice without notice. On the afternoon in question, Austen came to him and told him to put his clothes on and go home, as he (witness) had finished work. Their Worships decided that the case had not been proved, and it would be dismissed; the Chairman remarking that the Tyldesley Council would evidently have to make some difference in their arrangements in the future. Mr. Brierley said there ought to be notice given in an employment of that kind. The case against the other defendants was then withdrawn.

The annual report of the Directors of Meters Limited, to be submitted at the annual meeting in Manchester next Friday, sets forth that the trading has resulted in a gross profit of £32,327. A sum of £2466 has been spent out of revenue on repairs and renewals. After providing for interest on the debenture stock, the net profit amounts to £19,129, out of which interim dividends at the rate of 5½ per cent. per annum upon the preference shares and of 5 per cent. per annum upon the ordinary shares were paid in November last; and the Directors now recommend that further dividends at the rates of 5½ and 6 per cent. per annum, making the ordinary dividend 5½ per cent. for the year, be paid, that £4000 be added to the reserve fund, and that the balance of £962 be carried forward.

MISCELLANEOUS NEWS.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

The Half-Yearly General Meeting of the Association was held last Tuesday, at the Cannon Street Hotel, E.C.—Mr. T. H. Goodwin Newton in the chair.

The Secretary (Mr. Robert W. Wilson) read the notice convening the meeting.

The Chairman, in affixing the seal to the register of proprietors, said it was satisfactory to note that the number of proprietors was on the increase, as it had been for many years past. On this occasion, there were sixty more than in the previous half year.

The Secretary then read the report of the Directors as follows:—

The present half-yearly ordinary general meeting of the proprietors has been convened in conformity with the Association's Acts of Parliament for the purpose of receiving a report from the Directors upon the affairs of the Company, and of declaring a dividend for the half year ended the 31st of December last.

The following summary shows the results of the Association's operations during that period: The quantity of gas made in the half year ended Dec. 31 last was 3869 million cubic feet; the quantity made in the corresponding half year was 4445 million cubic feet—a decrease of 576 millions.

The decrease in the quantity of gas made at Vienna, owing to the loss of the supply of gas to the inner districts on Oct. 31, 1899, amounted to 863 million cubic feet. Consequently, omitting the Vienna results from the comparison, the other stations of the Association show an increase in the production of gas amounting to 287 million cubic feet, or at an average rate of 8·84 per cent.

The total number of lights on Dec. 31 last was 2,439,054; at the close of the corresponding half year the number of lights was 2,160,071—a net increase of 278,983.

The total mileage of mains in use on Dec. 31, 1900, was 1775; and on Dec. 31, 1899, the total length was 1650. This increase of 125 miles includes 54 miles of mains at Lieben-Prague, where the Association acquired the gas-works and concessions in the course of the half year under review.

The number of consumers on the books of the Association on Dec. 31 last was 209,267, as against 179,970 on Dec. 31, 1899—an increase of 29,297.

The plant and mains at all the stations were maintained in a due state of efficiency.

Owing to the diminution of the Association's business in Vienna, the total revenue derived from the sale of gas was somewhat less. The profit of the half year under review, however, was about the same as that in the corresponding period of 1899. This result is mainly due to the fact that the expenditure connected with the winding up of the Association's business in the inner town of Vienna was considerably less during the half year under review than in the corresponding half year.

The average gross cost of coal, owing to the high prices ruling last year, increased by 3s. 7·04d. per ton; the net cost of coal, the item on the expenditure side which really affects the results of a gas company's workings, was, however, less by 1·35d. per ton than in the corresponding half year. This is due to the decreased quantity of higher priced coal carbonized at Vienna, and to the considerably increased revenue derived from the sale of coke at the other stations. The revenue derived from the sale or treatment of tar and ammoniacal liquor showed a decrease due to the restricted operations at the Vienna station.

The important extensions necessitated at most of the stations by the increase in the consumption—an increase which has been maintained during the half year under review—have been proceeded with, and have entailed a large expenditure of capital.

At Aix-la-Chapelle, the new purifier-house, intended to receive the purifiers to be transferred from the Vienna station, was completed.

Progress was made at Antwerp with the erection of the water-gas plant and of the new purifiers, commenced in the previous half year.

At Berlin, the further installation of inclined retorts at the Gitschinerstrasse works, commenced in the previous half year, was completed in time for the winter season. The heaviest item of construction expenditure was the cost of the new works at Mariendorf, where excellent progress was made during the half year with the erection of the first section, which will be put in action next winter. The manufacture of gas-meters was during the half year transferred from the Gitschinerstrasse to the new works at Mariendorf. The maximum capacity of the new meter-works has, however, already been overtaken, and an extension is contemplated. A contract with the Commune of Buckow—a suburb to the south-east of Berlin—was concluded for fifty years, until 1951.

At Brussels, the water-gas plant at Forest, commenced in the previous half year, was put in action; and the railway siding into the Koekelberg works was also completed. The Directors availed themselves of an offer to dispose of the premises in the Rue Marcq, formerly used for the Association's offices at Brussels. The erection of the new show-room in the Boulevard Léopold II. at Molenbeek—a suburb of Brussels—was completed.

The new three-lift gasholder at Flushing was finished and put in action.

At Frankfort, additional producing power, necessitated by the increased gas consumption, was obtained by the completion of the additional seven benches of inclined retorts at the Bockenheim works, the erection of which had been commenced in the previous half year.

Good progress was made at Vienna during the half year under review with the dismantling of the works no longer required for the supply of the inner districts, and with the removal of the mains. Of these latter, 150 miles out of a total of 313 miles had been taken out up to Dec. 31, 1900. These mains, as stated in a previous report, will be available for future use either at the other stations or in the suburban districts of Vienna.

At Floridsdorf, and in the adjoining communes, considerable extensions of the system of mains have been found necessary; the Association having concluded contracts for thirty years with the communes of Bisamberg, Stammersdorf, and Strebersdorf, and for nineteen years with the Commune of Leopoldau. All these communes will be supplied with gas from the Floridsdorf works, which, as stated in the preceding report, is not subject to the jurisdiction of the Municipality of Vienna.

A portion of the site of the gas-works at Tabor, for which the Association had no further use, was disposed of on advantageous terms.

As previously stated in this report, the Directors acquired, on Oct. 1 last, the gas-works at Lieben—an important suburb of Prague, the capital of Bohemia, with concessions for the supply of gas in the communes of Karolinenthal, Lieben, Vysehrad, and Vysocan; the Association having the right, in the case of the three last-mentioned communes, to supply gas to private consumers in perpetuity. The Lieben works also supplies gas in portions of the city of Prague itself, in competition with the municipal gas-works there.

The Directors regret to report the death of Landrath W. L. Janssen, who

had efficiently served the Association as their agent at Aix-la-Chapelle for a period of eighteen years.

The Directors desire, in conclusion, to draw the attention of the proprietors to the accounts for the half year ended the 31st of December last. These have been duly audited, and, from them, the Directors have, in accordance with the provisions of the Companies' Clauses Consolidation Act, prepared a scheme, showing the profit of the Association for the half year and the portion thereof applicable to the purposes of dividend, which they recommend now to be declared—viz., a dividend of 5 per cent. for the half year ended Dec. 31 last, payable, free of income-tax, on and after Tuesday, the 14th inst.

The Directors who go out of office by rotation are: Thomas Henry Goodwin Newton, Esq., Colonel Josiah Wilkinson, and Arthur Lucas, Esq. These gentlemen are eligible for re-election and offer themselves accordingly. The Auditor who goes out of office by rotation is: Sir Joseph Sebag Montefiore, who is eligible for re-election, and offers himself accordingly.

The CHAIRMAN said that such was the report which the Board were enabled to lay before the proprietors for the past half year. Before he moved its adoption, he would make a few remarks upon it and upon events which had occurred since the close of the half year. A comparison of the statistics given in the report was really more useless than at any time during the transition stage consequent upon the changes at Vienna; and he forbore to compare themselves with other gas companies at home or abroad, though he did not for a moment fear the result of comparison by others. There were two points, however, upon which they might congratulate themselves. One was that the sales of gas at all the stations left to the Association increased by no less than 8·8 per cent., or, expressed in terms which might be more readily understood, they had sold during the half year 1266 million cubic feet more gas at those stations than in the corresponding period of 1899. And, as the decrease in the volume of the business of the Association at Vienna amounted to no less than 844 million cubic feet, it showed that they had made up, in a little more than one year, by the increase at the other stations, one-third of their lost output at Vienna. The other fact, which appealed perhaps more sensibly to them, was that they had been able to earn sufficient profit to maintain the dividend at the highest rate—10 per cent.—that had ever been paid. (The Chairman emphasized the word dividend, and added that he said nothing about bonus.) Proceeding, he said this had been achieved in face of difficulties which, when viewed before the event, appeared insurmountable. It was only necessary to remind the proprietors of the fact that, for the coal carbonized during the half year under review, they had to pay, for such coal as was exported from this country, a price just 100 per cent. more than in the corresponding period of last year—that was to say, 16s. per ton delivered on board compared with 8s. In fact, the profit for the half year would have been very adversely affected had it not been for the judicious contract entered into with the German Syndicate of Colliery Proprietors two years ago, and for the substantial increase in the selling price of coke, which, combined, brought the net cost of coal to a figure slightly lower than in the corresponding half year. This result would be better realized if he said that, had the Association been obliged to bear the whole of the average increase of 3s. 7d. per ton on the 376,000 tons of coal carbonized, there would have been charged to their working expenses no less a sum than £66,000—equal to a diminution of nearly 2 per cent. of dividend for the half year. Another burden which they had to bear—and which was a very hard one too—was that, notwithstanding their diminished profits at Vienna, they had to pay income-tax there and here on the average of three years' profits, including two during which they had had the benefit of the profit derived from the supply of gas to the whole city. Speaking of income-tax, it was well he should remind the proprietors that, to pay the dividend free of income-tax, practically increased its amount, when the tax was at 1s., by ½ per cent. per annum, and, of course, more when it was at 1s. 2d., as it was at present. Reference was made in the report to important extensions necessitated at many of the stations by the growth of business, and, in a general way, an indication was given of what these extensions consisted, and where they were being carried out. When he had the pleasure of addressing the proprietors in November last, he gave it as his opinion that the extensions then being made were a cause for congratulation; and he had every reason to believe that the extensions which the Directors had recently made, and were still making, had also been judiciously undertaken, and would prove to be of material benefit to the Association. He might mention, in order to give an idea of their magnitude, that the estimates for 1900 were no less than £350,000 more than they were in the previous year; and this year the amount for which they must make provision was, in round figures, half a million sterling—the greater portion of which would be spent upon the new large works at Mariendorf, near Berlin, at which station the Directors anticipated a largely increased make of gas in the near future. It would, of course, be understood that this large expenditure would not be immediately productive. It represented money transferred from investments bringing in low rates of interest to others where, for the moment, it produced nothing at all. In fact, until the productive power and storage capacity of the works involved were fully utilized, the return upon the expenditure could not be properly ascertained. The funds for these extensions were provided, as the proprietors were aware, from the monies received from Amsterdam, and from assets at Vienna turned into money, and, of course, aided by plant transferred from Vienna to other stations, and (as he stated six months ago) on very profitable terms, considering the high rates that had recently prevailed for engineering work. These extensions, he trusted, would not for some time to come necessitate the Board approaching the proprietors for money for capital purposes. Another heavy item of capital expenditure for the half year under review was the purchase of the Prague works and concessions. They had now had an experience of some six months' working there; and the Directors had reason to believe that a fair return would be obtained from this outlay. The proprietors might expect a word on the subject of the coal tax. Personally, it was enough for him that his country required, at a time of national financial stress, the imposition of this tax. But, if it was to be in any sense a permanent tax, it must in several ways be made more discriminating, to prevent it working a distinct injustice. It meant to the Association a charge on income of £10,000 per annum. The Directors, in conjunction with those of other companies similarly situated, memorialized the Chancellor of the Exchequer on the subject of a rebate on present coal contracts entered into before the 18th ult. But up to the present, they had not received any encouragement to hope for exemption. Regarding a temporary loan of £100,000 from their bankers with which the half year commenced, it had (the Chairman said) answered its purpose, and had since been repaid by the sale of securities. In concluding, the Chairman paid a well-deserved tribute to the merits of the staff both abroad and at home, and moved the adoption of the report.

Mr. J. HORSLEY PALMER seconded the motion, which, without discussion, was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Colonel JOSIAH WILKINSON, a dividend of 5 per cent. for the half year was declared upon the £3,800,000 stock of the Association, free of income-tax.

The retiring Directors (Mr. T. H. Goodwin Newton, Colonel Wilkinson, and Mr. Arthur Lucas) and the Auditor (Sir Joseph Sebag Montefiore) were re-elected.

Cordial votes of thanks were next passed to the Directors, for their able management of the affairs of the Association; to the Chairman, for his conduct in the chair; and to the staff at home and abroad.

The proceedings then terminated.

BOMBAY GAS COMPANY, LIMITED.

The Ordinary Meeting of this Company was held last Thursday, at the London Offices, No. 6, Drapers' Gardens, E.C.—Mr. ROBERT DAVIDSON in the chair.

The SECRETARY (Mr. J. Hill Perrins) read the notice convening the meeting; and the report and accounts—which were referred to in the "JOURNAL" for April 30—were taken as read.

The CHAIRMAN said the accounts gave such a full view of the results of the year's working that it was almost unnecessary for him to say anything to supplement them. The result was, on the whole, satisfactory, notwithstanding the plague and famine that had prevailed in India. They had had many deaths among their own workmen; and in this connection he was sorry to say that they had to record the death of Mr. Reginald A. Gandon, the Company's promising young Assistant-Manager, who died of cholera. To succeed him, the Directors had appointed Mr. W. T. Lane, of the Oxford Gas Company, who was highly recommended. Regarding the accounts, the gross revenue for the year was £72,285, which was an increase of £6597 over 1899. The private consumption continued to advance; and the additional revenue from that source was £2804—representing an increased consumption of nearly 13 per cent. Residuals also showed the large increase of £3457. These returns were the more gratifying as the previous year's figures were also of a most satisfactory character—thus indicating a continued steady growth of the Company's business. On the expenditure side of the profit and loss account, the cost of coal was £6703 more. This, on the face, looked a very considerable increase; but it was more apparent than real, as the bulk of the coal used, owing to the high price of coal in England, was Indian and Japanese, paid for in silver, so that the Company benefited largely in exchange. But, of course, the yield of gas was a good deal less. It was intended, however, to continue the use of native and Japanese coal as long as it was advantageous to the Company to do so. Another benefit was that they did not require to keep such a large stock; and, with large stocks of coal, there was, of course, always the risk of firing. The item of wages was a little more; but salaries were £349 less. The loss on exchange was £2537 less than in the previous year. This was owing to the purchase of coal at Bombay in rupees; and so there was much less money to remit. Of the balance available, it would be seen that the Directors had carried £2500 to the reserve. It would be remembered that in 1896 and 1897, £2300 was withdrawn from the fund in order to maintain the dividend; so that they were now more than replacing the sum. Besides this, they were paying ½ per cent. more dividend than at this time last year, and were carrying forward £968. He thought that, on the whole, the shareholders would consider the report a satisfactory one. Concluding his remarks, he moved the adoption of the report and the declaration of a dividend of 3½ per cent., free of income-tax (making 6½ per cent. for the year).

Major W. F. GORDON seconded the motion.

Mr. CUFF congratulated the Directors on the good report they were able to present. There were three items in the accounts that had particularly struck him. It was gratifying to find that, notwithstanding a larger quantity of coal had been purchased, and that native and Japanese, the cost of purifying was less. Salaries and collectors' commission were also less; and the most extraordinary thing of all was that rates and taxes were lower. This was a most satisfactory thing to find in a gas company's accounts. That the item of purifying was less with the native and Japanese coal was an indication that it must have been thoroughly satisfactory; and he was glad to hear the Chairman's statement that the Directors intended to continue using it.

Mr. LOUIS PENNY asked for an explanation of the increase in the construction account, and whether there had been any extraordinary expenditure beyond the usual repairs. He also noticed there had been a large increase in the item of meters. The Company usually kept a large stock of meters; and he saw there had been £1000 more spent in that direction.

The CHAIRMAN replied that the increase in the construction account was almost entirely due to fresh mains that had been laid; and the greater demand for meters accounted for the increase in that item.

Mr. GANDON: There has been a large increase in the number of consumers.

The SECRETARY: 303 during the year.

The motion was unanimously carried.

On the motion of Mr. H. E. JONES, seconded by Major W. F. GORDON, the Chairman was re-elected to his seat at the Board, as was also Mr. Frederic Lane Linging, on the proposition of the CHAIRMAN seconded by Mr. GANDON

Proposed by Mr. A. SUART, and seconded by Mr. CUFF, the Auditors (Messrs. E. A. Flinders and Magnus Ohren) were re-appointed.

Mr. LOUIS PENNY moved a cordial vote of thanks to the Chairman and Directors for their services. Speaking as a shareholder, and as one cognizant of the mode of gas manufacture, he thought that the result of the year's accounts was very satisfactory and most creditable to the Directors and to the Manager. The disadvantages the latter had had to contend with—viz., high freight, increased cost of English coal, bad local trade, and plague—only showed what an energetic and able Manager could do when placed in a trying and responsible position. It was fortunate that the Company were able at such a time to purchase Indian coal, and to greatly reduce the cost of the chief item in the expenditure. The Directors were no doubt fully alive to the fact that the native coal was not quite an unmixed blessing, as it only produced about 7000 cubic feet of gas to the ton instead of nearly 10,000 feet, and that the quality of the coke was very inferior. But after all this resolved itself into the amount of the difference in price. Care no doubt would be taken that the use of English gas coal would be resumed when prices reached the old level—if they ever did; so that only such quantity of Indian coal would be used as would not jeopardize the Company's excellent coke trade. He was led to think from the large amount of residual products in stock, that there must be some difficulty in disposing of all the coke made; but the Directors all know how bad it was to have a large and increasing coke stock, and would no doubt call the attention of the Manager to this point. The increase from gas and other sources was most satisfactory, and an extraordinary evidence of the vitality of the Company.

Mr. E. A. FLINDERS seconded the motion, which was unanimously carried.

The CHAIRMAN briefly responded.

A resolution, which was confided to Mr. MAGNUS OHREN, suitably thanked the Manager, Secretary, and staff both at home and abroad.

CENTRAL GAS LIGHTING COMPANY.

The Annual General Meeting of the above-named Company, which at a joint-stock undertaking with a capital of 25,000,000 frs., and having at its head M. Eugène Lebon, was held in Paris a short time since. The following particulars in regard to the Company's operations in the past year were furnished to the proprietors in the report presented by the Directors on the occasion. The Company have a number of stations in France and Spain, as well as in Algeria and Egypt. In Algiers new works were commenced last year, in order to amalgamate the services of the city and the neighbouring communes of El Biar, Mustapha, and St. Eugène. Electric light works were completed at Yvetot; and all the cables and wires were purchased from a local concern in Almeria, whereby the number of consumers was greatly increased. Progress was made with the works at St. Malo, St. Servan, Honfleur, and Quimper. The sale of gas and electricity produced last year a total of 12,672,468 frs. (£506,899), compared with 11,787,007 frs. (£471,480) in 1899; being a difference of 885,461 frs. (£35,419). This increase has been continued during the present year. In January there was an augmentation in the revenue of 122,247 frs. (£4890), and in February of 83,254 frs. (£3330); making together 205,501 frs. (£8220). The accounts for the period under review were not adversely affected by the rise in the price of coal, as the Directors were able to raise the charge for gas in those places where it was below the maximum allowed by the concessions. The result was that the gross profit was 6,372,518 frs. (£254,901), against 5,836,315 frs. (£233,453) in 1899; an increase of 536,203 frs. (£21,448). At the same time there was an increase of 720,749 frs. (£28,830) in the expenses—from 3,915,255 frs. (£156,610) to 4,636,003 frs. (£185,440). After deduction from the above-mentioned 6,376,518 frs. of the interest, sinking fund, and management expenses, there was left a net sum of 1,736,514 frs. (£69,460), available for distribution among the shareholders. This was less by 84,201 frs. (£3368) than the amount required to pay the same dividend as in 1899; and, for the first time, the reserve fund of 500,000 frs. of undivided profits standing over since 1886 had to be drawn upon to make it up. The Directors recommended a dividend of 60 frs. per share, as before.

Bolton Water Profits.—The balance-sheet for the past financial year was recently before the Water Committee of the Bolton Corporation at a special meeting. The total profit on the year's transactions was £14,543; and of this amount £14,000 will be devoted to the borough fund in relief of rates, and £543 transferred to the renewal fund.

The Relations between Employers and Employed.—The following offer has been made by Mr. W. H. Northcott, of the Hatcham Iron-Works, London, S.E., to the Institution of Mechanical Engineers, the Institution of Junior Engineers, the Institution of Foremen Engineers and Draughtsmen, and the Amalgamated Society of Engineers: "A very pressing problem of the present day, and one that will have to be faced in the not distant future, is that of so reconciling the interests of employers and employed that the best efforts of both may be exerted for their mutual advantage and for the national benefit. At present this is far from being the case; and, with a view of eliciting suggestions from your members towards a remedy, I shall be happy to give five guineas for the best short paper on the subject. The judges to be appointed by your Council." The offer was five guineas to each body, or 20 guineas in all. The Institution of Mechanical Engineers declined the offer, on the ground that the subject was not suitable for discussion by their younger members. The Amalgamated Society of Engineers did likewise, on the ground that their rules did not allow them to accept it. The Institution of Junior Engineers accepted the offer, and appointed as judges Colonel Archibald Denny, of Messrs. Denny Bros., Dumbarton, Mr. John F. Aspinall, Engineer to the Lancashire and Yorkshire Railway Company, and Mr. W. H. Northcott. Papers are to be sent in to them by March 1, 1902. The Institution of Foremen Engineers also accepted the offer, and appointed as judges the Dean of Ripon, Mr. A. Langton, Mr. I. M'Cullum, and Mr. H. Stokoe. Papers are to be sent in by March 31, 1902.

GLASTONBURY GAS ARBITRATION AWARD.

The award in the Glastonbury Gas-Works purchase arbitration has now been made, and is as follows:—

(1) The £2200 mortgages to remain a first charge on the undertaking. (2) The sum of £25,635 is awarded. (3) Capital expenditure since July 17, 1900, is to be repaid in addition. The Act also provides that the Company shall have: (*a*) The cash balances, other than consumers' deposits, in the hands of the Company, or in those of their bankers or agents on the day of the transfer, and all sums or investments or securities representing sums standing to the credit of their reserve fund, and all stock-in-trade and stores; and (*b*) all rents and profits of, and all book and other debts due to, the Company, and all rates accrued due on the day of the transfer. In addition to the sums to be paid by the Corporation to the Company, the Corporation shall, on or before the 1st of January, 1901, pay to the Company the sum of £625 incurred by them preliminary to and of, and incidental to, the promotion by them of their Bill; and the sum of £200 towards the costs of the winding-up of the Company. The Corporation shall also pay all the costs and expenses of, and incidental to, the arbitration and transfer of the undertaking of the Company. The Corporation are also to pay compensation to any officers and servants in the regular employment of the Company not retained by the Corporation in the same or similar office. The Company shall sell to the Corporation, and the Corporation shall purchase, the stock-in-trade and stores of the Company as they stand on the day of the transfer at such price as shall be agreed upon between them or, failing agreement, shall be determined by valuation.

The Arbitrators in this case were: For the Company, Mr. M'Intosh Valon, J.P.; for the Corporation, Mr. Alfred Colson; and the Umpire was Mr. Charles Hawksley. The expert witnesses for the Company were Mr. Thomas Newbigging and Mr. Joseph Cash; and for the Corporation, Mr. E. H. Stevenson and Mr. W. R. Chester. The valuations of the witnesses were as follows: For the Company, Mr. Newbigging, £33,608; and Mr. Cash, £32,150. For the Corporation, Mr. Stevenson, £13,268; and Mr. Chester, £12,861. The award, as already stated, was £25,635.

NEW GAS-WORKS FOR SCUNTHORPE.

Opening Ceremony.

Last Monday was an important day for the town of Scunthorpe, in Lincolnshire, for it saw the realization of one of the great schemes undertaken for the benefit of the ratepayers—namely, the opening of the new gas-works, which have been constructed from the plans of Messrs. Stevenson and Burstal. The gas supply in Scunthorpe dates back 26 years, when plant was put down by Messrs. Joseph Cliff and Sons, of the Frodingham Iron Company, who have since added the large steel-works; and they extended to the township the supply primarily intended for their own works. In the session of 1898, Messrs. Cliff promoted a Bill seeking statutory powers over the joint district of Brumby and Frodingham, and also the urban district of Scunthorpe; but it was withdrawn on the opposition of two districts—Scunthorpe applying for a joint Gas and Water Bill in the following session. They were successful; and by the Bill, which received the Royal Assent on July 13, 1899, they were authorized to construct and maintain gas and water works, and other powers were conferred. Under the provisions of this Act, the Scunthorpe District Council have successfully carried out the erection of gas-works on the latest and most economical lines; due provision having been made for future extensions. The capacity of the works is 25 million cubic feet per annum; but, by building the retort-house up to the boundary wall, it may be increased to 55 millions. The works are situated at the western end of the town, on a site which is the property of the Council.

The main block comprises a continuous range of buildings 260 feet long, substantially built of brick in cement, carried down to a firm concrete foundation. The retort-house contains four settings of retorts (22 mouthpieces in all) on the Klönne regenerative system, with a large coal-store attached. Leading from the retort-house is the men's mess-room—a large airy apartment 20 feet square—from which communication is gained to the lavatory and bath-room. Farther on comes the boiler-house, 46 ft. by 24 ft. 6 in., with one Lancashire boiler 30 feet long and 8 ft. 6 in. in diameter, with Wilton's furnace fittings to burn coke. A bed is provided for a second boiler. Here power will be generated to pump the water from an underground circular tank, 26 feet in diameter and 16 feet deep, built in concrete, into which all roof water is conducted, and thence lifted into an overhead tank, built on a tower containing the exhauster-room, 15 ft. 6 in. by 20 feet, with a meter store-room the same size over it. The tank has a capacity of 12,500 gallons. It may be pointed out that this large amount of boiler power is designed with the object of generating energy later on for pumping the town's water supply. Attached to the boiler-house is a set of pumps for tar, water, and ammoniacal liquor. The dynamo-room is 25 feet by 45 feet. The smithy, which is 25 feet square, is fitted with an open stove and a closed stove. This completes the main block of buildings.

The exhauster-room contains one of Waller's exhausters, to pass 15,000 cubic feet of gas per hour, and another bed for a second exhauster when required. The condenser is of Clapham's "Eclipse" tower type—two towers—with base and connections for a third. The tower scrubber is 40 feet by 8 feet, with a Livesey washer. In the purifier-house are two purifiers 12 feet square, with four tiers of wood grids, charged with oxide of iron, and controlled by one of Weck's centre-valves. Here provision is made for two more purifiers. The meter-house attached contains a Cowan station meter to pass 10,000 cubic feet of gas per hour. The holder is a two-lift, 61 ft. 6 in. diameter, in a concrete tank, and having a capacity of 125,000 cubic feet. A commodious Manager's house, to which is attached a weighing office and a governor and photometer room, is situated at the entrance gates.

The works are substantially built, of a neat and plain design, and the workmanship leaves nothing to be desired. The contractors for erecting the main buildings and works were Messrs. Wright and Son,

of Lincoln, whose contract amounted to £6754; the plant, machinery, retorts, and settings being supplied by the Leeds Fire-Clay Company, whose contract amounted to £7459. Mr. A. M. Cobban, the Council's Surveyor, was the Resident Engineer. The works were handed over as a going concern; the firing of the retorts and the starting of the plant being carried out under the supervision of Mr. W. R. Grindley, the representative of the Leeds Fire-Clay Company. In Mr. J. W. Turner the Council have secured a thoroughly capable Manager.

The turning of the gas into the town took place, as already mentioned, last week; the ceremony being performed by Mr. Joseph Fletcher, J.P., the Chairman of the District Council. In doing so, he expressed the hope that the supply of the new light might bring prosperity to the town and district; and that those present might live for many years to enjoy it, and also to see the other schemes in hand brought to a successful issue. The first jets, on the pillars at the entrance to the works, were lighted, amid the applause of the company.

PRESENTATION TO ALDERMAN MILES.

An interesting gathering took place at the Gas Offices, Bolton, last Friday evening, the occasion being a presentation by the officials and employees of the Corporation Gas Department to Alderman Miles, J.P., who until lately filled the position of Chairman of the Gas Committee. The presentation took the form of a life-size oil painting, a gold brooch with amethyst centre for Mrs. Miles, and a silver tea and coffee service, with an oak tray to match—the latter being the gift of the Fittings Department. Mr. L. WILD, the Vice-Chairman of the Gas Committee, presided.

Mr. W. SMITH (the Gas Engineer and Manager of the Corporation), in making the presentation, said he had a very pleasant duty to perform on behalf of his brother officials and a few friends. They felt they could not allow Alderman Miles to relinquish the chairmanship of the Gas Department, which he had so long and so ably occupied, without showing some little of the esteem and respect which they had for him. During the thirteen years that Alderman Miles had occupied the chair, he had shown many kindnesses and much consideration to the officials. As Gas Engineer, he had come into close contact with Alderman Miles, and he could bear testimony to the fact that at all times he was ready to lay aside his own business and enter into anything for the good of the department. Under his direction, the department had grown enormously. In the past fifteen years, the demand for gas had nearly doubled; their labour had been reduced 33 per cent., and their wages had increased, and so had the profits. Even last year, when coal was nearly at famine price, gas was 3d. per 1000 cubic feet cheaper than it was when Alderman Miles accepted the chairmanship. He next referred to the improvements which had been effected in the works by the introduction of generator furnaces and stoking machinery, and in the distributing plant by the relaying of the mains throughout the district. All these alterations and extensions, which had proved very profitable, had been strongly advocated by Alderman Miles; and in a great measure the credit was due to him for the increased prosperity of the gas undertaking. He advised the Committee; the Committee took his advice; and the result was seen in the position of the works to-day. He concluded by expressing the hope that Alderman Miles and his family might be blessed with a long, prosperous, and happy life.

Mr. W. WALCH, as one of the oldest officials of the Gas Department—having been connected with it since 1853—cordially endorsed these sentiments.

Dr. PANTON, as at one time a more or less stormy member of Alderman Miles's Committee, expressed the wish to associate himself with the presentation. He had the greatest possible regard for Alderman Miles, and he united with previous speakers in wishing him, and also his wife and family, long life and happiness.

Alderman MILES, in acknowledging the gifts, assured the donors that their presents would remain in his family, and be highly appreciated by them. In the 26 years during which he had been a member of the Council—and for the whole of this time he had been on the Gas Committee—he had witnessed very great changes for the better. The ratepayers of the town did not know, nor did many members of the Council, what an enormously valuable property they possessed in the gas-works; and he hoped in the hands of the present Chairman, Vice-Chairman, and Committee they would continue to prosper. He then referred at some length to the circumstances which led to his relinquishment of the chairmanship of the Gas Committee. In regard thereto he said he had only two regrets—first, that the Council had allowed this matter to go on for nearly four years, and next that at last it should culminate in the way it had done. About four years ago, looking at it from one point of view, it was a misfortune that on a certain day a gentleman asked him if he would become a Director of Meters Limited. He put the matter in such a light that he (the speaker) could hardly refuse; and he did not know that there was any member of the Council who would have taken a different view of the situation than he did. He accepted the position. He did not do it without deep thought. He asked himself whether he would be doing his duty to the Council and also in his capacity of Director as well. Time had gone on, and he thought he had proved that he had no intention of doing otherwise than his duty by the Council. When contracts had to be given out for meters, he had taken no part in the matter in one form or another. He deemed it his duty to quit the chair, and leave the matter entirely in the discretion of the Committee. He felt he could not have done more than this; and he thought the officers of the department would bear him out when he made the assertion that he had not, either directly or indirectly, attempted to influence any one of them in the business of the department. He was assured that he occupied a perfectly legal position; and, being conscious of his own integrity, he never gave a thought as to whether or not he had a right to occupy it. He did not like being suspected; and therefore he thought it best to leave no room for suspicion. He was still in the Council, and he hoped, while he remained there, to be able to render assistance to the department with which he had been so long associated.

GAS EXAMINATIONS.

Next Year's City and Guilds Examinations.

We learn from the "Programme of Technological Examinations of the City and Guilds of London Institute for the Session 1901-2," which has just been issued, that the examinations next year will be held on Saturday, April 26, from 2.30 to 6.30, and that they will include questions founded on such subjects as the following:—

ORDINARY GRADE.

1. The construction of a retort or oven best adapted for the destructive distillation of coal. 2. The setting of retorts and the construction of retort-furnaces. 3. The effects of temperature in modifying the quantity and quality of gas produced. 4. The description and arrangement of apparatus employed for the conveyance of the gas immediately upon its leaving the retorts. 5. Apparatus best adapted for cooling the gas and for removing the products of condensation. 6. The methods of removing the gaseous impurities from the cooled gas, including a description of the materials employed, and the most suitable condition of the gas for effective purification. 7. The use of an exhauster. 8. The methods employed for controlling the pressure at the works, so as to secure an adequate supply of gas at the various points of consumption, with a due regard for economical effect. 9. The various instruments used in gas-works for ascertaining and recording pressure and exhaust. 10. The laying of mains and service-pipes. 11. The construction and fixing of gas-meters, and the fitting up of premises for the supply of gas. 12. The various forms of gas-burners in general use. 13. The simplest methods of ascertaining the illuminating power of gas. 14. The simpler physical and chemical principles involved in the various processes of gas manufacture and in the tests for ascertaining the illuminating power and purity of the gas and the value of the bye-products. 15. The practical method of carrying out these tests. 16. Influence of temperature and pressure on the volume of the gas.

HONOURS GRADE.

1. The characteristic properties of the various kinds of coal, and their value for gas-making purposes. 2. The effects of temperature upon the production of residuals. 3. The chemical composition of coal gas, and the effect of each component upon the illuminating and calorific power of the gas. 4. The principles of combustion, and their application to the working of retort-furnaces. 5. The more advanced physical and chemical principles involved in the processes of destructive distillation of coal and in the condensation and purification of the resulting gas. 6. The methods of gas analysis, including those for ascertaining the amount of impurities in the crude gas. 7. The practice of photometry, and the determination of the calorific power of gas. 8. The best means of burning gas in order to develop its illuminating power to the greatest advantage. 9. Labour-saving appliances in the retort-house, and the working of retorts. 10. The construction of gasholders, purifiers, and other gas apparatus. 11. The management of the various portions of the plant in order to obtain the best efficiency of the apparatus, with due regard to economy in working. 12. The method of dealing with such emergencies as are of more common occurrence in gas-works through breakdown of machinery or other failure of plant. 13. The working up of ammoniacal liquor. 14. The manufacture and purification of carburetted water gas. 15. Methods of enrichment of coal gas by means of oil, &c. 16. Such important recent developments of the gas industry as have been fully described in the Technical Press.

Certificates are awarded on the results of each of the above examinations. For the full technological certificate, the candidate must qualify as stated in Rules 41 and 42 of the "Programme," which contains full particulars of all the examinations conducted by the Institute. It may be obtained of Messrs. Whittaker and Co., Paternoster Square, for 1s., post free.

The Polytechnic Question Papers.

Readers of the "JOURNAL" are aware that the classes in "Gas Manufacture" conducted by Mr. Walter Grafton, F.C.S., at the Regent Street Polytechnic, have been attended by students who have given evidence, by their success at the City and Guilds Examinations, of the excellence of his training. We published last Tuesday the question papers set at the examinations held on the 1st inst.; and we are now able to supplement them by those with which Mr. Grafton tested his pupils' progress at the close of his course on the 17th ult.

ORDINARY GRADE.

1. Describe the methods of heating clay retorts by "direct firing," and by "generator firing." 2. Give a sectional sketch of one form of hydraulic main, and state what advantages are gained by maintaining a liquor seal. 3. Describe, with the aid of sketches, an efficient method of water distribution in tower scrubbers. 4. Describe the Gas Referees' test for sulphur compounds other than sulphuretted hydrogen, giving the method of determining the quantity present. 5. What position should the "Standard" washer-scrubber occupy in relation to the other apparatus, and what are its advantages over the tower scrubber? 6. How would you detect the presence of SH_2, CO_2, and CS_2 in a sample of gas in the purifying plant? 7. Explain the method of laying gas-mains and of jointing same. 8. Give a sketch showing the construction of Harcourt's 10-candle pentane lamp, and state its advantages over candles. 9. Describe the incandescent gas-burner, and state upon what the illuminating power depends. 10. Briefly describe the products resulting from the distillation of coal; classifying the diluents and illuminants of the gas from those having heating properties.

HONOURS GRADE.

1. Explain a method of determining the calorific value of illuminating gas. What do you understand by B.T.U.? 2. Describe, with sketches, a setting of inclined retorts, and state what advantages are achieved over the horizontal form. 3. Describe fully a carburetted

water-gas plant. 4. What is the effect of temperature upon the products resulting from the distillation of coal? Give relatively the composition of purified gas distilled at (*a*) a low and (*b*) at a high temperature. 5. Explain the system of guiding and supporting gasholders by wire ropes. 6. How is the illuminating power of gas determined by the table photometer? Explain the working of Harcourt's 10-candle pentane lamp. 7. What are the chief characteristics of cannel and common gas coal? Clearly show the difference in the products of distillation. 8. Give a sketch of one form of condenser you think best, and state what impurities are removed by it. 9. How would you ascertain the approximate point of leakage in a principal gas-main without unnecessary unearthing of the main? 10. Describe a method adopted for the complete purification of coal gas. How would you determine the quantity of sulphur compounds in the purified gas?

Four hours were allowed for each paper. The following are the names of the successful students: Ordinary Grade—E. Cecil Creed, first prize (bronze medal and certificate); H. M. Boyle, second prize (books to the value of 10s. net and certificate); Joseph Rice, third prize (books to the value of 5s. net and certificate). Honours Grade—P. F. Scarth, first prize (silver medal and certificate); John Holland, second prize (books to the value of 10s. and certificate); Arthur Mead, third prize (books to the value of 5s. and certificate).

CONTINENTAL GAS COMPANIES AND THE EXPORT COAL DUTY.

It is almost superfluous to point out in these columns that the new coal duty cannot fail to have an important adverse effect upon the revenue of those gas companies whose business is carried on abroad and who export their raw material, or a large portion of it, from this country. Some remarks, which shed a little light on the impression the new duty will have on European Gas Companies, were made by the Chairman of the Imperial Continental Gas Association (Mr. T. H. Goodwin Newton) at the meeting of the proprietors last Tuesday, as reported elsewhere; and, at the same time, he spoke of a communication which had been made to the Chancellor of the Exchequer directing his attention to the hardship which the new imposition will inflict on such companies. The communication referred to was made jointly by the Imperial Continental Gas Association, the Continental Union Gas Company, and the European Gas Company; and it was as follows:—

To the Right Honourable Sir M. E. Hicks Beach, Bart., M.P.

The Chairman and Directors of the under-mentioned Companies beg respectfully to direct the attention of the Chancellor of the Exchequer to the hardship which the new export duty on coal would involve on certain British Companies carrying on business abroad under special conditions.

The Imperial Continental Gas Association, the Continental Union Gas Company, and the European Gas Company were established shortly after the discovery of coal gas, to introduce this mode of lighting to various Continental cities by means of British capital.

In accordance with the custom prevailing on the Continent, the concessions held by the above Companies provide for a fixed price of gas under all circumstances; so that the new duty on about 540,000 tons of gas coal which the above Companies export annually for the purpose of their business, would have to be borne entirely by the English shareholder.

The amount of these dues represents a loss of £10,000 to the Imperial Continental Gas Association, £12,000 to the Continental Union Gas Company, and £6000 to the European Gas Company, and in the case of the two last-mentioned Companies is equivalent to a reduction of 1 per cent. dividend.

The loss will affect 8800 shareholders, practically all British subjects; and, as the Chancellor of the Exchequer has stated that the foreigner is to pay, the above Incorporated or Registered English Companies, all paying English income-tax, pray for exemption from the new dues, the more so as their shareholders are mulcted in both ways—viz., coal tax and income-tax.

Signed, for, and on behalf of, the
I.C.G.A.—J. Horsley Palmer
C.U.G.C.—F. Tendron.
E.G.C.—N. E. B. Garey.

The signatories are Directors of the three concerns named. As pointed out by Mr. Newton, the Companies received no encouraging reply to their memorial; and they have now to face the inevitable. This representation of facts to Sir Michael Hicks Beach discloses how the peculiar conditions of Continental gas supply make the infliction of the duty more burdensome in the cases of these and similarly placed gas companies than in those of companies operating in other countries and possessing the power of raising their charges for gas. Some of the latter regard the new impost with very little perturbation; they merely speak of it as one of the risks incidental to their business. With reference to the sums mentioned in the memorial, it must not be taken that they are in any way indicative of the tonnage of coal used by the Companies referred to, as, in the case of the Imperial Continental Gas Association, they have important Continental contracts running, and the other Companies, so far as we know, may be likewise situated. It is, of course, upon companies who have heavy English contracts running at the late high prices that the additional shilling will have its full weight.

Singapore Gas Company, Limited.—In the report the Directors of this Company will present at the annual meeting on the 30th inst., they state that the profit for the year ending Dec. 31 is £2419, which added to £1059 brought forward, makes a total of £3478. After deducting £1514 paid as interim dividend and debenture interest, a balance is left of £1964, out of which the Directors recommend a dividend for the half year at the rate of 4 per cent. per annum, free of income-tax; making, with the interim dividend paid in November, 3½ per cent. for the year, and leaving a balance of £677 to be carried forward.

DUKINFIELD CORPORATION GAS DEPARTMENT.

The Past Year's Working.

The Gas Engineer and Secretary to the Corporation of Dukinfield (Mr. Harrison Veevers) has presented his report for the year ending the 31st of March. It opens with the gratifying statement that, considering the difficulties of working the department during the year, the pecuniary result has not been so serious as might have been expected. These difficulties have, of course, arisen from the great increase in the price of coal, and from the inferior quality of some of that which was supplied. The average price was 16s. 3d. per ton, as against 11s. 7¼d. in 1899-1900, and 10s. 4¼d. in the preceding year—being advances respectively of 40 and 50 per cent. The yield of gas per ton, due to the inferior quality of some of the coal, was only 9883 cubic feet, compared with 10,186 and 10,402 cubic feet in the two previous years. Fortunately, no advance had to be made in the charge for gas. With a prospect of diminished prices of coal, combined with the economy resulting in manufacture by the use of the new regenerator-heated retorts next season, Mr. Veevers thinks the financial results for the ensuing year may be regarded as promising a favourable balance-sheet. The past winter was notable for an absence of fogs, and the demand for gas was limited; consequently the question of increased storage has not arisen acutely. The total quantity of gas supplied was 77,247,629 cubic feet (against 76,104,600 cubic feet), divided as follows: Cottages (ordinary meters), 37,881,300 cubic feet, or 49·04 per cent.; do (prepayment meters), 6,604,075 cubic feet, or 8·55 per cent.; mills, 25,161,718 cubic feet, or 32·57 per cent.; public lamps, 6,247,178 cubic feet, or 8·09 per cent.; and used on works, &c., 1,353,358 cubic feet, or 1·75 per cent. The accounts accompanying the report show that the gas-rental in the past financial year amounted to £10,800, compared with £10,605 in the year 1899-1900; the total revenue being £14,206, against £13,731. The expenditure was £11,736, compared with £9272; and the balance £2470, against £4459. Adding to the first-named balance £24 cottage rents, there was not sufficient money to meet annuities, interest, and sinking fund charges by £492, which had to be taken from the balance of the profit and loss account, reducing it to £1963. The make of gas was 86,630,000 cubic feet; so that the leakage was 9,382,371 cubic feet, or at the rate of 10·83 per cent. A considerable improvement was, however, effected in the March quarter, when it was only 5·3 per cent., as compared with 10·17 per cent. in December, 17·68 per cent. in September, and 16·66 per cent. in June. The net cost of production, exclusive of the capital charges, was 2s. 1·88d.; but with these added, it is brought up to 2s. 11·08d. As the average price of gas is 2s. 9·55d., there is a loss of 1·53d., against a profit in the preceding year of 4·75d. A table giving the various items of the balance-sheets from 1891 shows that the income from gas in that year was £7945, with the price at 3s. per 1000 cubic feet, varying, according to consumption, 1d. to 5d., and no meter-rents charged to consumers of less than 50,000 cubic feet per quarter. In the following year the price was reduced to 2s. 11d., at which it has remained, with the exception of a rise to 3s. 2d. in 1894, till the present time.

At the monthly meeting of the Town Council on Monday last week, the Chairman of the Gas Committee (Mr. J. Cooke), in moving the adoption of their minutes, said the balance-sheet which had been placed before the Council was not so satisfactory as the Committee would have liked. He thought the Council would agree with him that the past year had been a very trying one for all producers of gas. The difficulty with regard to coal alone had put them to an extra cost, for the same weight of material as they had last year, of more than £2000. According to the report of the Manager, the average price of coal for the twelve months worked out at 16s. 3d., against 11s. 7½d. and 10s. 4¼d. for the two previous years—an increase of 40 and 50 per cent. respectively. One pleasing feature was they had not raised the price of gas, though most of their neighbours had felt constrained to do so. Another point was that the yield of gas per ton was less, owing, to a great extent, to a good portion of the coal not being quite up to the usual standard. They had also made a point of keeping the works, mains, meters, and other property of the department in good repair; and, everything considered, he thought, a loss of £492 was not so bad, particularly when they remembered their position as compared with that of their neighbours and gas makers throughout the country. They ought to be thankful for having got through the year so well as they had done. As to the future, it was decidedly more promising; and with the prospect of a diminishing price of coal, and the saving they hoped to effect with the new retorts, which he trusted would be ready for use before October, they might look forward to much better results next year. The minutes were confirmed.

CHESTERFIELD GAS AND WATER SUPPLY.

Five Years' Progress.

Our readers may possibly remember that five years ago the gas and water works at Chesterfield were transferred to a Board for the sum of £247,336. The new controlling body entered upon their duties with a rather difficult task before them, as there was considerable scope for improvement. A report just issued by them shows that their efforts in the public interest have been signally successful. One of the first things the Board undertook was the checking of the leakage in the water-mains; and within twelve months the quantity passing out of the reservoirs was thereby reduced from 1,460,000 to 729,000 gallons per 24 hours—almost exactly one-half. In the past five years, nearly 2000 new supplies have been laid on, and 600 water-closets and 238 baths have been added. The daily consumption is now 838,400 gallons, or about 600,000 gallons per day less than it was in the autumn of 1897. The Board have added to the sources of supply by making boreholes at Linacre, which yield a regular daily quantity of 150,000 gallons. The fact that 106 million gallons were diverted down the bye-wash during the past year, shows that the present gathering-ground is not inadequate to the town's requirements. The output of gas in the last year of the Company's existence was 58 million cubic feet. The output for the

year ending March last was 102,862,000 cubic feet—an increase in five years to the extent of 77½ per cent. The number of consumers has risen from 1228 to 3318, of whom 1450 are supplied on the prepayment system. At the works, the old retorts have been superseded by others on the inclined system, with regenerative furnaces and automatic charging machinery. The present capacity of the works is 600,000 cubic feet per diem. The gross profits of the whole undertaking for the five years have been £67,417. Out of this sum, £34,168 has been paid as interest on stocks and loans, and £20,249 as sinking fund instalments and loan repayments. The profit has thus been £13,000.

MANCHESTER CORPORATION ELECTRICITY SUPPLY.

Reduced Profits.

At a Meeting of the Manchester City Council, specially convened by the Mayor (Mr. T. BRIGGS), held on Wednesday, the estimates of the Electricity Committee came up for approval.

Dr. BISHOP, in moving their adoption, admitted that they were the most unfavourable which the Committee had as yet had to submit to the Council. The cause, in his own opinion and in that of the Committee, of the decrease in the percentage of profits in this department was that the price of current had been rushed down to an excessive extent. They only wanted a reasonable return; but their obligations were such that the continual lowering of the charge for electricity in past years had been absolutely unjustifiable. The price had been reduced when the demand was enormous, and nobody asked for a reduction; and the Committee in the past had not been justified in reducing it so hurriedly as they had done at a previous meeting. Mr. Batty had intimated his intention of raising the question of advancing the price of current to enable the Committee to pay over a larger sum in aid of the rates than was put down in the estimates. If the Council wished to make any such amendment, he did not think the Committee would oppose it.

Mr. WAINWRIGHT felt that the gas consumers ought not to be paying practically for what the electricity consumers were getting, and that the latter should not be given an advantage over the former. If the gas consumers were made to pay a higher price for their gas, why should not the electric light consumers be called upon to bear an additional charge for current? He begged to move, as an amendment, that the estimates be sent back for revision, so that the amount to be handed over in relief of the rates should be at least equal to 1d. in the pound, and that the necessary readjustment of charges to effect this amendment should be made.

Mr. H. GRIMSHAW, in seconding the amendment, remarked that he thought it would be this year, as it was last, a fatal error to increase the price of gas; and he largely shared in the view of the Chairman of the Gas Committee (Alderman Gibson) that there would be a decreased revenue from the Gas Department on this account. As it was, however, unless they asked the Electricity Committee also to provide something in the same way, they would have dear gas and cheap electricity; and, to be consistent, they must ask the Committee to provide a larger contribution to the funds than they proposed.

Alderman COPELAND saw no analogy between the cases of the two Committees. To a business mind, it appeared that, inasmuch as the cost of the production of gas was so much more than formerly, owing to the high price of coal, the consumer ought to pay more; but if an increased price had to be paid for electricity, it should be borne by the out-townships.

Mr. ROYLE concurred with the last speaker that the same arguments did not apply to electricity as to gas. In the Gas Department they had a large accumulated capital invested, for which they thought they should have some remuneration. In the Electricity Department, however, they had not; and perhaps they would scarcely be justified in making an advance in price to secure a larger profit.

Alderman GIBSON pointed out that a principle was involved in the question before the Council. Were they going to lay down the proposition that whenever a Committee of the Corporation were unable, from whatever cause, to realize the amount of profit which they, in their judgment, thought they ought to make, they must be forced to do it by raising the charge for the manufactured article? To his mind, such a principle was wrong; and therefore they ought not to ask the Electricity Committee to increase their price. He was of opinion that they had aimed a very severe blow at the prosperity of the Gas Department; but that undertaking was much larger, more consolidated, much wealthier, and better able to bear the result of the iniquitous policy which the Council had pursued. He believed that if they put this extra weight upon the Electricity Committee in their present position, they would be doing a great deal of harm, and perhaps an irreparable injury. Under these circumstances, he could be no party to placing the Committee in such a position. They were already overweighted with their load of responsibility; and he appealed to the Council not to hamper the Chairman in his work by asking him to advance the price of electricity.

Dr. BISHOP having replied,

The amendment was lost by a large majority; and the proposal to accept the estimates as presented by the Committee was adopted.

Water Gas for Carlisle.—The Gas Committee of the Carlisle Corporation, at their meeting on Wednesday last, again considered the report by Messrs. Corbet Woodall and Son upon the proposal for an installation of carburetted water-gas plant at the gas-works. Mr. Scott, representing the firm, gave a further report upon the subject; whereupon the Committee passed a resolution approving of the plans and specifications submitted, and instructing the firm to advertise locally for tenders for the buildings, including tanks, purifiers, &c., and other work in connection with the scheme. The Committee also agreed that the tender of Messrs. Humphreys and Glasgow for the carburetted water-gas apparatus, water and tar system, boilers, and oil-tank, for the sum of £5446, should be accepted.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1307.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 12	10½	Alliance & Dublin 10 p.c.	19—20	..	5 5 0
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
300,000	100	Jan. 2	5	Australian 5 p.c. Deb. .	101—103	..	4 17 1
200,000	5	Nov. 14	6½†	Bombay, Ltd. . . .	6—6¼	..	5 0 0
40,000	5	,,	6½†	Do. New, £4 paid	4¼—4½	..	5 9 5
380,000	Stk.	Feb. 14	12	Brentford Consolidated	260—265	..	4 10 7
270,000	,,	,,	9	Do. New . . .	187—192	..	4 13 9
50,000	,,	,,	5	Do. 5 p.c. Pref. .	128—132	..	3 15 9
159,375	,,	Dec. 13	4	Do. 4 p.c. Deb. .	113—116	..	3 9 0
220,000	Stk.	Mar. 14	10	Brighton & Hove Orig.	222—227	..	4 8 1
226,320	,,	,,	7	Do. A. Ord. Stk. .	160—165	..	4 4 10
1,022,500	Stk.	Feb. 27	5	Bristol, 5 p.c. max. .	119—121	..	4 2 8
420,000	20	Mar. 28	10	British.	41—42	..	4 15 3
50,000	10	Feb. 28	12	Bromley, Ord. 10 p.c. .	24—26	..	4 12 4
79,000	10	,,	9	Do. 7 p.c. . . .	19—21	..	4 5 8
500,000	10	Oct. 12	6	Buenos Ayres (New) Ltd.	9—10	..	6 0 0
220,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	97—100	..	4 0 0
150,000	20	Mar. 14	8¾	Cagliari, Ltd. . . .	22—24	..	6 17 6
100,000	10	Sept. 28	8	Cape Town & Dis., Ltd.	14½—15½	..	5 3 3
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	51—53*	..	5 13 2
550,000	Stk.	Apl. 12	12	Commercial Old Stock	275—280	..	4 5 9
236,425	,,	,,	9	Do. New do. .	205—210	..	4 5 9
238,237	,,	Dec. 13	4½	Do. 4½ p.c. Deb.	130—135	..	3 6 8
800,000	Stk.	Dec. 13	9	Continental Union, Ltd.	165—170	..	5 5 11
200,000	,,	,,	7	Do. 7 p.c. Pref.	163—168	..	4 3 4
575,000	Stk.	Feb. 28	5	Crystal Palace Ord. 5 p.c.	120—125	..	4 0 0
60,000	,,	,,	5	Do. 5 p.c. Pref.	127—132	..	3 14 1
486,070	10	Jan. 31	11	European, Ltd. . . .	20—21	..	5 4 9
354,060	10	,,	11	Do. £7 10s. paid	14½—15½	..	5 6 5
15,079,883	Stk.	Feb. 14	4⅞	Gas-light and Coke 4 p.c. Ord. . .	94—96	..	4 11 8
2,600,000	,,	,,	3½	Gas-light and Coke 3½ p.c. max. .	90—92	+½	3 16 1
3,799,735	,,	,,	4	Gas-light and Coke 4 p.c. Con. Pref.	103—112	—1	3 11 5
4,063,425	,,	Dec. 13	3	Gas-light and Coke 3 p.c. Con. Deb.	94—96	..	3 2 6
70,000	10	Oct. 26	8	Hongkong & China, Ltd.	13⅝—14½	..	5 10 4
3,800,000	Stk.	Nov. 14	10	Imperial Continental .	215—220	..	4 10 11
473,600	Stk.	Feb. 14	3½	Do. 3½ p.c. Deb. Red.	100—102	..	3 8 8
561,000	Stk.	Feb. 28	10	Liverpool United A	234—236	..	4 4 9
678,100	,,	,,	7	Do. do. B	172—176	+2½	3 19 7
306,083	,,	Dec. 28	4	Do. do. Deb. Stk.	120—122	..	3 5 7
75,000	5	Dec. 13	6	Malta & Medn., Ltd. .	4⅜—5¼	..	5 14 3
560,000	100	Apl. 1	5	Met. of 5 p.c. Deb.	104—107	..	4 13 5
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	102—104	..	4 6 6
541,920	20	Nov. 14	3½	Monte Video, Ltd. . .	9½—10½	..	6 13 4
717,946	Stk.	Feb. 22	8½	Newc'tle & G'tesh'd Con.	226—227	..	3 14 11
312,855	Stk.	Dec. 28	3½	Do. 3½ p.c. Deb.	99—101	—1½	3 9 4
150,000	5	Nov. 29	8	Oriental, Ltd. . . .	7—7½	..	5 6 8
135,000	5	,,	8	Do. New, £4 10s. pd.	5½—6¼	—¼	5 15 3
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼—1⅝	..	4 11 5

*Ex. div.

Issue.	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
60,000	5	Feb. 28	7	Ottoman, Ltd. . . .	5⅜—6½	..	5 12 0
851,070	10	Apl. 26	7	River Plate Ord. . .	10¾—11¼*	..	6 4 5
250,000	Stk.	Dec. 28	4	Do. 4 p.c. Deb. .	98—100	+1	4 0 0
250,000	10	Mar. 28	8	San Paulo, Ltd. . . .	11—12	..	6 13 4
135,000	Stk.	Mar. 14	10	Sheffield A	235—240	..	4 3 4
209,984	,,	,,	10	Do. B	234—236	..	4 4 9
523,498	,,	,,	10	Do. C	234—236	..	4 4 9
5,761,885	Stk.	Feb. 14	5	South Met., 4 p.c. Ord.	129—132	—2	3 15 9
1,547,965	,,	Jan. 16	3	Do. 3 p.c. Deb. . .	93—96	..	3 2 6
380,940	Stk.	Nov. 14	5	Southampton Ord. . .	108—113	..	4 8 6
70,825	,,	Jan. 16	4	Do. 4 p.c. Deb.	105—110	..	3 12 9
120,000	Stk.	Feb. 28	6	Tottenham and Edmonton A. 5 p.c. B. 3½ p.c. 4 p.c. Deb.	115—120	..	5 0 0
250,520	,,	,,	4½		85—90	..	5 0 0
80,100	,,	Dec. 13	4		109—114	..	3 10 2
182,380	10	Jan. 16	5	Tuscan, Ltd.	8—9	..	5 11 1
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	97—102	..	4 18 0
230,000	5	Feb. 28	9	West Ham, 10 p.c. . .	9—10	..	4 10 0
147,000	10	,,	6	Do. 7 p.c. . .	11½—12½	..	4 16 0
128,984	Stk.	Dec. 28	4	Do. 4 p.c. Deb.	105—110	..	3 12 9
				WATER COMPANIES.			
780,499	Stk.	Dec. 28	11	Chelsea, Ord. . .	293—298	—2	3 13 10
150,000	,,	,,	5	Do. 5 p.c. Pref. .	155—160	..	3 2 6
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	138—143	—2	3 2 11
175,785	,,	Mar. 28	4½	Do. 4½ p.c. Deb. .	140—145	..	3 2 1
1,720,560	Stk.	Apl. 12	7	East London, Ord.. .	188—193	..	3 12 6
654,740	,,	Dec. 13	4½	Do. 4½ p.c. Deb. .	145—150	..	3 0 0
797,687	,,	,,	3	Do. 3 p.c. Deb. .	95—97	..	3 2 6
700,000	50	Dec. 13	8	Grand Junction 10 p.c. max..	107—110	..	3 12 9
310,000	Stk.	Mar. 28	4	Junction 4 p.c. Deb..	123—127	..	3 3 0
708,000	Stk.	Feb. 14	14	Kent	300—305	..	4 12 5
160,000	,,	,,	7	Do. New, 7 p.c. max..	200—205	..	3 8 4
1,043,800	100	Dec. 28	10½	Lambeth, 10 p.c. max..	270—280	..	3 15 0
406,200	100	,,	8	Do. 7½ p.c. max..	207—212	..	3 15 5
350,000	Stk.	Mar. 28	4	Do. 4 p.c. Deb..	123—126	..	3 3 6
503,000	100	Feb. 14	13⅜	New River, New Shares	405—410	—2	3 7 1
1,000,000	Stk.	Jan. 31	4	Do. 4 p.c. Deb..	125—130	..	3 1 7
902,300	Stk.	Dec. 13	7	South-wark and 5 p.c. Pref. .	Ord. . . . 188—193	..	3 12 6
126,500	100	,,	7		7½ p.c. max. 177—182	..	3 16 11
489,200	Stk.	,,	5		153—158	..	3 3 3
1,019,585	,,	Apl. 12	4	Vauxhall 4 p.c. A Deb.	125—130	..	3 1 7
1,155,066	Stk.	Dec. 13	10	West Middlesex. . .	265—275	..	3 12 9
200,000	,,	,,	4½	Do. 4½ p.c. Deb. .	140—145	..	3 2 1
200,000	,,	Mar. 14	3	Do. 3 p.c. Deb. .	96—98	..	3 1 3

*Ex. div.

† Next dividend will be at this rate.

ELECTRIC LIGHTING NOTES.

The Electrical Committee of the Middlesbrough Corporation have decided to borrow £34,100 for additional works. At the last meeting a number of tenders were accepted for plant; one of them being from a firm abroad whose tender for an engine and dynamo was about £200 below the lowest English offer, with earlier delivery.

A Didsbury correspondent writes to the "Manchester Guardian" as follows: "I wonder when our City Fathers will be able to supply us suburban residents who use their electric lighting with sufficient light. I have just paid a fabulous amount for electric lighting. Now, while I write, it is by gaslight. Still the units go on counting. It will, I think, be better to revert to the farthing dips."

It is estimated that the past year's trading of the Electricity Department of the Shoreditch Borough Council will result in a deficit of more than £3000. Coal shows an additional cost of £3133. It has therefore been decided to increase the price from 4½d. to 5d. per unit, to alter the scale for large consumers (from 2d. to 4d.) to a fixed charge of 4d., and to raise the scale for power (from 1½d. to 2d.) to 2d. per unit for all consumers. The revised list will come into operation on July 1.

The Electric Light Committee of the Warrington County Borough Council are about to extend their works at a total cost of £14,000, made up as follows: Generating plant, £6720; mains, £6500; engineering and contingencies, £780. No provision has been made for any extension of the public lighting. The Committee have resolved that application be made to the Local Government Board for their sanction to the borrowing of the further sum not exceeding £15,000 for the above-named purposes.

At the monthly meeting of the Whitehaven Town Council, Alderman Dees (Chairman of the Finance Committee) dealt with the estimates for the present year. He stated that the expenses of the electric lighting had increased very largely. Coal, which had been estimated to cost £550, had come to £824; while wages had also gone up considerably. The expenditure on repairs, owing to the unfortunate breakdown of engines, dynamos, and mains, had reached £457 more than had been reckoned. The total deficiency for the year was £754. He foreshadowed an increase in the charges to private consumer, as the price at present (3d. per unit) would well permit of it.

The accounts of the Electricity Committee of the St. Pancras Borough Council for the past year were submitted last Wednesday. The gross revenue amounted to £49,329—an increase of £4449 compared with 1899. Additional revenue of £3207 came from public lighting, and £1242 from private lighting. The total units sold during the first half of the year were 1,056,613—the average price realized being 4·48d. per unit; and in the second half, 1,239,773 units and 3·63d. The net profits amounted to £2921, increased to £4056 by the balance brought forward. A sum of £2916 has been placed to the reserve, and the remainder is carried forward. The Committee express disappointment that the reductions in price have not produced a larger increase in business. The Council have decided to retain the charge of 6d. per unit for the first hour's maximum demand, and to increase the rate for subsequent hours from 2d. to 3d. per unit.

Last Tuesday, an inquiry was held at the Town Hall, Manchester, by Mr. H. P. Boulnois, on behalf of the Local Government Board, into the application of the City Council for sanction to borrow, among other sums, £310,110 and £500,000 for electricity purposes. The Deputy Town Clerk (Mr. T. Hudson) explained that the Corporation had agreed to supply other districts outside their own area with electric light, and had thus accepted heavy obligations. The districts referred to were those of Levenshulme and Heaton Norris, Moss Side and Withington, Droylsden, and Openshaw. They had also entered into agreements in connection with the tramway scheme. He asked that the repayment of the loan might be spread over 25 years. The amount authorized to be borrowed by the Electricity Department up to the end of March last was £884,011, and the total amount expended on capital account to the same date was £867,322; leaving £16,689 unexpended balance. Dr. Bishop, Chairman of the Electricity Committee, stated that the demands for electric current had steadily grown, and the Committee were at present practically unable to meet them, though the progress of the undertaking for the supply of electrical energy had been very considerable. The consumers had doubled in the last five years; and the present number of lamps served could also be doubled if the Committee were in a position to accept the applications at present made for the electric light. In March, 1897, the number of consumers was 1581, and the number of lamps connected 144,028. In March of the present year, the consumers numbered 3800, and the lamps 382,437. Acting on the advice of Dr. Kennedy, the Committee had for the present decided to cease connecting. It was quite impossible to go on without a new generating station; and the Corporation had arranged to provide one on land at Stuart Street, Bradford, within the city. It was intended to have accommodation for plant of 60,000-horse power; but for the present the Committee only asked for about a quarter of it. The whole of the works were urgently required. Mr. John Phythian, Deputy-Chairman of the Committee, Dr. Kennedy, Consulting Engineer, Mr. C. S. Allott, Architect, and Mr. C. F. Metzger, Chief Electrical Engineer, also gave evidence in support of the application. Dr. Kennedy said the Stuart Street site was conveniently situated, and there was plenty of room for extension. Mr. Metzger stated that it was intended to light with arc lamps all the main streets through which the electric cars passed. The estimated cost of these lamps was £75,000, being at the rate of £35 each, including cable and other accessories. The lamps would be placed at intervals of about 100 yards. There was no opposition.

Every fortnight ten railway trucks full of West Indian bananas are consigned by Messrs. Elder, Dempster, and Co., at Bristol, to one of their agents, who has been appointed a member of the Costers' Federation. The fruit is stored, quite green, in the head offices of the federation in London, and ripened by many gas-jets.

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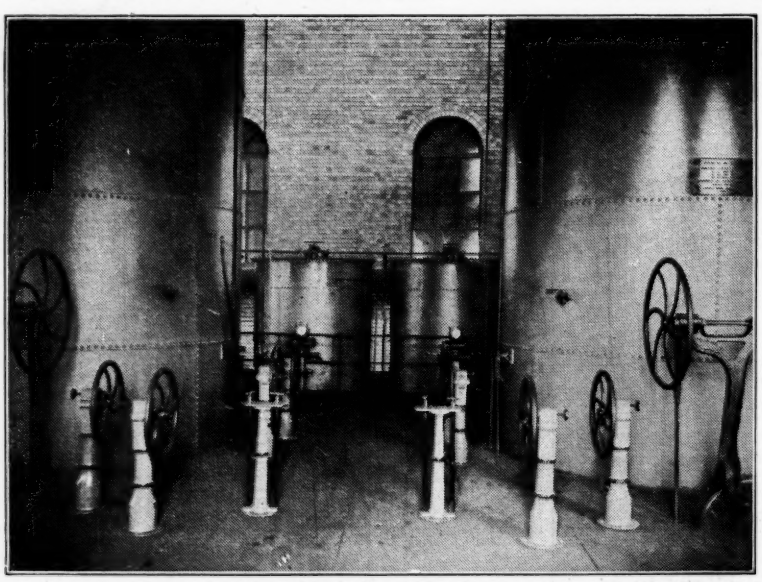

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MANCHESTER CORPORATION WATER SUPPLY.

Annual Report of the Committee.

The Water Committee of the Manchester Corporation state in their annual report that satisfactory progress was made last year with the extension of the settling-pools and the laying of the 40-inch pipe for supplementing the watercourse between Rhodes Wood and Hollingworth. The enlargement of the settling-pool at Arnfield was completed in January last, and the water has since been passed through it. The object of these pools is to enable the Committee to render available a quantity of water which to some extent may be termed "flood water," and which they have not been able hitherto to deal effectually with; and it may be interesting also to know that when they are completed only a very small annual charge will be incurred in working them, as they will be inspected and managed by the reservoir keepers in the course of their ordinary duties. An exceptionally heavy flood occurred in the Longdendale Valley last August, being the heaviest experienced since the works were constructed. No damage was done to these; but the banks and pitching on some of the tributary streams were swept down the hillside into the reservoirs, and channels were formed where none previously existed. The Thirlmere works were maintained in an efficient condition, and the repair of leakages found in the aqueduct was carried out. The average daily quantity of water supplied from Thirlmere during the year was 8,092,298 gallons. In pursuance of the resolution of the Council of the 13th of June last, the Committee are taking steps for laying the second pipe in connection with the aqueduct—about 45 miles in length. Contracts have been let for about three-fourths of the pipes required. A full and constant supply of water was maintained during the past year; the average daily consumption being about 32¼ million gallons. The supply of hydraulic power made satisfactory progress, and was efficiently maintained. During the year, connections have been made to 33 additional buildings. The supply is now given to 385 premises; and the number of machines and motors agreed for is 1445. The weekly average quantity of power water pumped for the year was 3,007,000 gallons, and 2942 yards of hydraulic mains were put down; making the total length laid 17 miles 1443 yards. Two additional sets of pumping-engines were erected and started.

New Reservoirs for Rhymney.—The Rhymney and Aber Gas and Water Company have now commenced to construct their reservoirs at Blaen-Rhymney. It is estimated that the whole of the works will occupy about three years to complete. The site of the works offers a natural basin for the storage of water; there being a short valley tapering on to the fringe of the Breconshire county. In all there will be three reservoirs; but the contractors will first proceed with the largest of the works, which is naturally the lowest site in the valley. The necessary machinery is now being conveyed on to the ground, and upwards of 40 huts are being built to accommodate the workmen. The reservoir will be the main source of supply for Rhymney Valley.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Dumfries Gas Commission have, at their meeting this month, righted a wrong and created a new wrong for themselves. It seems that seventeen years ago the Gas Commission were persuaded to pay £20 towards the wages of a lamplighter; the argument being that, by the employment of an additional hand, the lighting and extinguishing would be facilitated, and the result would be a saving of gas to the Commission. But, while the Gas Commission have gone on paying the £20 yearly, the extra lamplighter has been forgotten. Then, since 1894, when governors to pass 4 cubic feet per hour were fitted up in the street-lamps, the Gas Commission have only charged as for 3 cubic feet per hour. In addition, the Corporation have been receiving a discount at the rate of 5 per cent. Now, when coal and other materials are dear, the Gas Committee resolved that these gratuities should cease; and they recommended so. The saving to the funds of the Gas Commission will be about £130 a year. There was some opposition stated to the proposals of the Committee; but in the end they were agreed to unanimously. The other affair was a proposal by Mr. Hiddleston to the effect that all accounts incurred by the Gas Commission should be paid in the financial year in which they were incurred. This is very beautiful in theory; but in practice it is scarcely workable, and is not sound policy. The arguments in favour of it were that better quotations would be got from merchants when it was known that the Commission paid promptly, and that the Auditor could not otherwise balance the accounts. I do not understand the latter position, and I presume it is not rested on a very stable foundation; for auditors are continually balancing accounts where everything is not fully paid up. Against the proposal, it was pointed out that the Commission had not themselves been paid for the gas sent out—the collection being in June; and that if coal and other merchants were to be paid at May 15, the Commission must obtain an overdraft from the bank, for which they would have to pay. This position seemed to make the motion of no avail; the matter being, any way, at least as broad as it is long. But the Commission, by 14 votes to 10, adopted the policy. They will find it an irksome one.

The Corporation of Helensburgh are making extensive additions to the gas-works in the town. Plans for the rebuilding of part of the works have been prepared by Mr. A. Gillespie, of Glasgow; and these are so arranged that further extensions, where necessary, may be made. The total cost will be about £2200; and it is satisfactory to know that further borrowing powers will not be required. It is probable that a better job, in every way, would have been made, if the Corporation had been allowed to acquire the land at the shore; but Mr. Gillespie and Mr. W. Blair, the Manager, may be trusted to do the best possible under the circumstances.

The Cleaning and Lighting Committee of the Town Council of Edinburgh have this week made up their estimates for the year from May 15.

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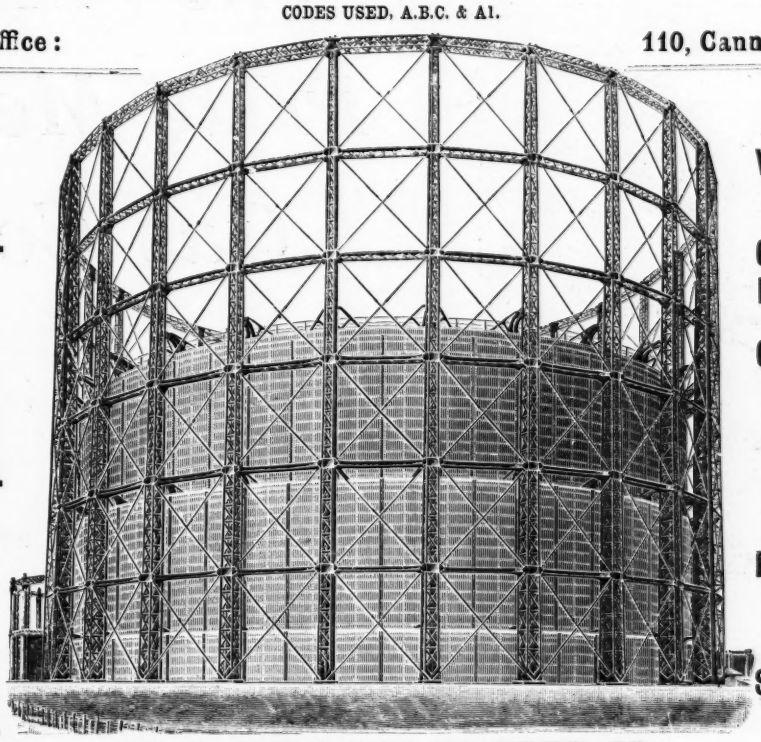

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GASHOLDERS.

The amount is £40,750. For the current year, the estimate is £38,760; and for the year 1899-1900, the actual expenditure on public lighting was £35,726. In 1888, the outlay on public lighting was about £14,000. We live in a much more extravagant age now.

I understand that the Carnoustie Gas Company, not having been taken over by the municipality, are about to enter upon a scheme of extension of their works. It is gratifying to observe that the breaking off of negotiations has not led to any feeling between the two bodies. This week the Corporation have given the Company permission to lay new mains upon the condition, simply, that the Company put the streets into a proper state of repair, to the satisfaction of the Corporation. In some places, the municipality insist upon the gas company paying a rent for permission to use the streets for the laying of pipes. They seem to think that in doing so they are making the gas company pay. But in this they are generally mistaken, because it is the consumer who, in the end, has to bear the burden.

It is suggested that the Corporation of Glasgow this year, instead of holding a two days' inspection of the water-works belonging to the city, should hold a one-day ceremony to celebrate the completion of the works which have been in progress for years, for the doubling of the water supply derived from Loch Katrine. The company will probably number about 500. The date will be towards the end of June.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *May* 11.

Sulphate of Ammonia.—The upward movement has continued throughout the week; and at the close the quotations are £10 12s. 6d. to £10 16s. 3d. per ton, delivered f.o.b. at the ports. The purchasing has been again largely for covering sales made in advance; but buyers abroad have begun to appreciate the altered situation, and there has been a fair amount of direct business. Prompt prices have also been readily paid for May and June deliveries. Further ahead £10 12s. 6d. per ton, ordinary terms, has been freely paid, f.o.b. Leith; and at the close there are no further sellers thereat. London quotation, Beckton terms, has also been advanced to £10 17s. 6d. per ton.

Nitrate of Soda is also firmer, and spot prices have been advanced to 8s. 7½d. to 8s. 9d. per cwt., according to quality.

LONDON, *May* 11.

Tar Products.—A steadier feeling prevails in benzol, especially 90 per cent.; several transactions having recently been reported. Undoubtedly, however, the great depression in the aniline trade prevents any substantial improvement in this article. Sales are reported at 8d. f.o.b. an out-port, casks included, while for forward delivery business has been done at 9d. f.o.b. London. As against this, however, business has been done at 6¾d. naked at makers' works in the Midlands. Solvent is remarkably dull, although at this time of year it is generally in brisk request. Carbolic is very quiet as regards both crude and crystals. Pitch is neglected. Shipments are almost finished for the present season; and just now consumers do not care to purchase for the autumn delivery. Salts are a shade better, and appear to have recovered from the recent slump. Creosote and tar oils generally show a decided improvement, which will probably be maintained over the next few months as the production will be small.

The average values obtaining during the week are: Tar, 14s. to 17s. 6d. Pitch, east coast, 29s.; west coast, 27s. Benzol, 90's, 8d. to 9d.; 50's, 7¾d. to 8d. Toluol, 1s. Crude naphtha, 4d. Solvent naphtha, 1s. 1d. Heavy naphtha, 1s. Creosote, 1¼d. to 1½d. Heavy oils, 2d. to 2¼d. Carbolic acid, 60's, 2s. 5d. to 2s. 6d. Naphthalene, 80s.; salts, 50s. Anthracene "A," 2¾d. to 3d.; "B," 2d. (nominal).

Sulphate of Ammonia.—A steady improvement has set in, principally in Beckton, for which the price yesterday was £10 17s. 6d., and to-day has been advanced to £11, and even at this the Gaslight and Coke Company are not anxious sellers. Business is reported at Liverpool at £10 17s. 6d. for immediate shipment. As regards Hull, no business appears to have been done at over £10 10s., although makers ask £10 12s. 6d. to £10 15s. As regards Leith, sales were made at £10 10s.; but this price has since been declined; and in all probability makers would ask £10 15s., although it is very difficult to fix the exact value.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The collapse of the colliers' threat to bring about a general suspension of work as a protest against the export duty on coal had been so generally anticipated, that it was utterly disregarded as likely to have any effect upon trade; and the movement has now culminated in its only logical issue—as an attempt to secure a stronger combination of the miners for the purpose of keeping up wages. Although the coalowners have been careful to officially disassociate themselves from any supposed sympathy with the threatened stoppage, it is unquestionable that many of them would have favoured a temporary suspension of work as helping to strengthen their hands in the negotiations which are now going on in connection with the ensuing twelve-months' contracts for gas coal, and the approaching locomotive fuel contracts; and their alternative proposal to the Chancellor of the Exchequer, of a tax spread over the whole of the coal raised in the United Kingdom, is only a too obvious attempt to bolster up the steadily declining home trade prices. Considering the time of the year, an exceptionally steady tone is being maintained in all the better qualities of round coal; and it is now tolerably certain that current rates will be held to during the remainder of the month. Stocks are not yet accumulating; and during the next few weeks there will be very large interference with the ordinary output as the result of numerous holiday stoppages at the pits. In the lower qualities of round coal, the position is not so strong; and in steam and forge descriptions, there is an increasingly keen competition from other districts—Derbyshire

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especially—which is weakening Lancashire prices. Concessions thus have to be made to prevent the trade of regular customers passing into other hands. This causes a good deal of irregularity in quotations; and prices for steam and forge coals at the pit may be said to range, according to circumstances, from about 10s. 6d. to 11s. 6d. and 12s. per ton. The gas coal season is opening slowly; but so far colliery owners, both in Lancashire and Yorkshire, are making a tolerably firm stand against concessions of more than about 2s. 6d per ton upon last year's rates. A few small contracts have been settled upon this basis, representing about 11s. to 11s. 6d. for good screened gas coal at the pit. There are, however, apprehensions in some quarters of a possible breaking away from this position when the larger contracts come upon the market for settlement; and there does not appear to be any great confidence that prices may not have to come substantially lower. The locomotive fuel contracts are likely to bring out some keen competition with Derbyshire, where hand-picked hard coals are already being offered at exceedingly low prices—viz., about 8s. to 8s. 3d. at the pit—and some of the Lancashire collieries are apprehensive that this may possibly have to be the basis upon which contracts will have to be settled, although generally they are at present declining to entertain any such figures. For engine fuel, prices in the open market continue very irregular, owing to the competition of surplus supplies from other districts, which are pushed for sale at much below the quoted rates of Lancashire collieries; and the common sorts of slack, especially, are becoming quite a drug. At the pit, Lancashire slack ranges from about 7s. to 7s. 6d. per ton for ordinary medium sorts, to 8s. 6d. to 9s. for the best qualities, with slack from other districts obtainable from about 4s. 6d. and 5s. upwards, according to quality. Shipping is moderate, with prices unchanged, 12s. to 12s. 6d. remaining about average figures for steam and forge coal delivered at Mersey ports.

Northern Coal Trade.—The decision of the miners not to strike has changed the aspect of the trade; business being now freely entered upon, and deliveries being steady and full. The Baltic trade—one of the most important of the trades for the northern coal industry—is now fully open, and heavy shipments are being made. Best Northumbrian steam coals are steady at from 12s. 9d. to 13s. per ton f.o.b., second-class steams are 12s. 3d. to 12s. 6d., and steam smalls are from 6s. to 6s. 6d. There is a good demand for steam coals generally; and there is the prospect of full work for some time ahead—there being a pressure to get away coal on the contracts during the continuance of the rebate of the duty. In the Durham coal trade, there is more dependence on a winter demand; but at present the collieries are working well. Prices are a little irregular. In the gas coal trade, higher prices have ruled; and the demand is still brisk. But the tendency is to ease in prices; and from 9s. 3d. to 10s. per ton f.o.b., according to quality, may be looked on as the current rates for Durham gas coals. Nothing has yet been heard of the large contracts for coal that are to be placed to begin delivery next half year. Best Durham coke for export is from 17s. 6d. to 18s. 3d. per ton f.o.b.; and blast-furnace coke is firmer at from 15s. to 15s. 6d. Gas coke is now in lessened production; and the stocks are rather lower. Prices vary a good deal; but from 12s. to 13s. per ton f.o.b. seems to be the price most generally quoted.

Scotch Coal Trade.—The volume of trade is deceptive, in respect that it now includes Baltic shippings, and therefore looks larger than, taking the agitation over the export duty into account, might be expected. There is otherwise no change to record. The miners are not going to strike work on account of the imposition of the duty; but they are to resist any attempt to reduce their wages, which is, in effect, a resolution that they are not to bear the burden of the duty. The public will pay the tax; and coal will, in all probability, be scarcely so cheap as it is now. The prices quoted are: Main 9s. to 9s. 3d. per ton f.o.b. Glasgow, ell 11s. to 12s., and splint 10s. 6d. to 10s. 9d. The shipments for the week amounted to 237,488 tons—an increase of 44,017 tons upon the previous week, and of 20,514 tons upon the corresponding week of last year. For the year to date, the shipments have been 2,996,598 tons—a decrease of 428,336 tons upon the same period of the previous year.

Ilkeston Gas-Works Extensions.—In connection with the extensions now in progress at the Ilkeston Gas-Works, two sets of tenders have lately been sent in for the boundary wall and cottages, and for the purifier-house, exhauster and meter house, and chimney. They show some fairly close competition, as will be seen from the following figures: Boundary wall, £1336, £1340, £1345, £1361, £1365, and £1365; purifier-house, &c., £2030, £2036, £2064, £2120, and £2289. The lowest tenderer in each case was successful. Other tenders have been accepted for purifiers, exhausters, meter, and washer; also a section of condensers, sulphate plant, and other fittings—the work being entrusted to Messrs. W. C. Holmes and Co., Bryan Donkin and Clench, Goddard, Massey, and Warner, and the Gas-Meter Company. The completed works will be equal to a production of 800,000 cubic feet per day.

The Aldershot Victory.—The remarks in our "Gleanings from the Committee Rooms" last Tuesday, on the victory recently achieved by the Aldershot Gas and Water Company over the Urban District Council, have been copied into the local papers; and the "Aldershot News," in a leaderette headed "How to Retrieve Disaster," comments as follows upon the subject: "The past week has not lessened the grave dissatisfaction with which the news of the Gas Company's success in Parliament was received. The ratepayers complain, and with reason, that no enterprise, and very little intelligence, was shown in preparing the opposition to the Bill, and that public money has been recklessly squandered in the feeble and ineffective effort made. The idea of an appeal has been mooted; but it is earnestly hoped that no action of that sort will be taken, for the vague chance of any reversal of the decision is no warrant for a further risk of the ratepayers' money. The only course that now remains to be followed is for the Council to face the position, and proceed as speedily as possible with the installation of the electric light, and to develop the scheme on lines that will compete successfully with the gas supply, and in that way destroy, as far as possible, one of the monopolies now enjoyed by the Gas and Water Company."

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Gas for Trade Purposes at East Dereham.—At the last meeting of the East Dereham District Council, Mr. J. H. Skinner moved—"That all gas used for trade purposes other than for illuminating shall in future be charged at a uniform rate of 3s. per 1000 cubic feet; any consumer taking in twelve months an aggregate of half-a-million feet of gas to be allowed 5 per cent., a million feet 10 per cent., 1½ million feet 15 per cent., and 2 million feet 20 per cent. discount off the total amount of his gas account." He said the Council were now supplying gas for cooking purposes at 3s. per 1000 feet, while the large consumers of gas for trade purposes were penalized to something like 20 per cent. above that figure. In the past they were told that the old gas-works were running at their greatest capacity, but it was not so now; and he thought the time had arrived when the large consumers should be treated on the same level as the smaller ones who used gas for cooking purposes. The proposition was referred to the Gas Committee.

The Lighting of Falmouth.—The question of lighting the streets of the town during summer nights was under the consideration of the Falmouth Town Council last Thursday. A scheme was submitted by the Lighting Committee, under which the lamps in the main streets and on the pier would be lighted at dusk and extinguished at daybreak, while in the rest of the town they would be extinguished at 11 p.m. Mr. E. A. Banks, the Chairman of the Committee, pointed out that by adopting incandescent lighting and other means they had saved about half-a-million cubic feet of gas. The saving would enable them to extend the hours of lighting without serious expense. Mr. Miller contended that it was throwing money away to keep the lamps alight after midnight. Mr. E. Williams said the Lighting Committee were pledged to a system of summer lighting, and it was an improvement which would be much appreciated. Mr. Banks remarked that on last year's estimates a saving of £120 had been effected. It would be a mistake to defer so desirable a reform. The recommendation of the Committee was adopted.

Gas-Meter Testing in Manchester.—The report for the year ended March 31 last to the Justices of Manchester of the Official Inspector of Gas-Meters (Mr. S. Dyson) shows that the number of meters of all classes tested was 35,104—an increase of 10 as compared with the previous year; and the fees charged amounted to £1120 12s. 6d., against £1092 5s., or £28 7s. 6d. more. There were 515 meters rejected. It is pointed out in the report that the gas-meter testing question under the Sale of Gas Act, 1859, occupied the attention of the Committee the whole of the year, and that in December a special report upon it was prepared by them giving their opinion on the imperfect tests applied under the Act, and the need for an additional test through the index. It was then explained that the test could not be carried out without the consent of the Gas Committee of the Corporation, and an agreement by that body to pay the extra cost incurred. After the report had been adopted at the annual meeting of Justices in January, it was decided that the Gas Committee should be again approached with a view to a settlement. Further correspondence has passed between the two Committees, but nothing has been settled.

Heywood's Gas Profits.—The monthly meeting of the Heywood Town Council took place last Thursday, when Mr. S. Firth, in moving the adoption of the minutes of the Gas Committee, said the result of the past year's working showed a net profit of £865, or a decrease of £901 compared with the preceding year, due to the extra price of coal, which cost 14s. 4·55d., against 11s. 3·63d. for 1899-1900, or an increase practically of 3s. 1d. per ton. The total consumption of gas was 114,726,000 cubic feet, against 114,688,000 cubic feet before, or an increase of only 38,000 cubic feet. The profit this time last year was £1767; and it was decided, after allocating £1000 to the rates, to place the balance of £767 to the profit and loss account. This, added to the profit this year, gives a total of £1633, out of which the Committee have again decided to hand over a sum of £1000 towards the reduction of the town rates.

The Lighting at the Glasgow Exhibition.—At the close of an article on the Glasgow Exhibition which appeared last Wednesday, the special correspondent of "The Times" referred to the lighting in the following terms: "One word about the lighting, which is a feature of the Exhibition. There is no attempt to rival the effects produced in Paris, but the opportunity has been taken to institute a practical and interesting comparison between the most modern systems of lighting. There is electricity of various kinds, acetylene gas, compressed oil, and compressed gas. I do not know to which the palm should be given; but there is no doubt that electricity is quite eclipsed by compressed incandescent gas. Two systems of the latter are installed—the Welsbach, in which the gas is compressed at a central station, and the ingenious Scott-Snell system, in which each lamp is made to compress its own gas by the heat generated by itself. It is an interesting comment on the rapidity with which things move that electricity—yesterday the latest-born and best-beloved offspring of physical science—is already being displaced by younger rivals."

The Corporation of London and the Water Question.—The County Purposes Committee of the Corporation of London have submitted to that body a report as to the suggestion of the last Royal Commission on the Water Supply of the Metropolis that a Water Board should be formed, consisting of not more than thirty members, selected on account of their business capacity and special knowledge, to take over the control of the water supply. No direct representation of the Corporation of the City of London was proposed; but, having regard to their position as the Local Authority in connection with the water supply in the City, to the prominent part they have for many years taken in reference to the proposed purchase of the Companies' property and rights, and the fact that the City Chamberlain is the Treasurer of the sinking fund constituted under recent Acts, the Corporation consider they are entitled to representation upon any statutory authority appointed to control and manage the water supply of London. The Committee recommend that they should be authorized to wait by deputation upon the President of the Local Government Board, with a view to making clear the Corporation's position and rights in that respect; and the recommendation has been adopted.

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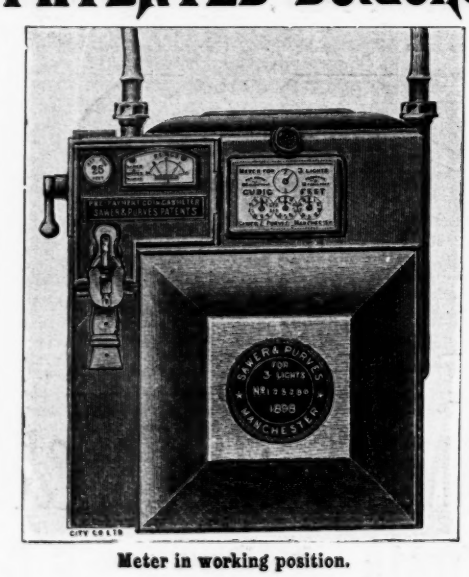

Meter in working position.

Meter with attachment removed without uncoupling.

Winsford District Council and the Gas-Works.—The local poll in connection with the purchase of the gas-works by the Winsford District Council was declared last Tuesday. The figures were: In favour of the Bill, 927; against it, 790—majority in favour, 137. The effect will be that the Bill to enable the Council to purchase the undertaking for £16,000 will be proceeded with.

Lecture on Coal Gas.—At the third ordinary meeting of the Huddersfield Technical College Engineering Society, Mr. E. A. Harman, M.Inst.C.E., the Corporation Gas Engineer, gave an interesting lecture on "Coal Gas: Its Manufacture and Distribution." It was fully illustrated throughout by lantern slides, drawings, models, and apparatus; and for it the lecturer was accorded a hearty vote of thanks by an appreciative audience.

Increased Storage at the Hanley Gas-Works.—A few days ago, the first section of the tank to contain the new holder which Messrs. C. & W. Walker are to erect at the Etruria station of the British Gaslight Company, which is under the management of Mr. J. R. Heath, was placed in position. The sinking of the ground at the old gas-works has necessitated the erection of a new gasholder, and for this purpose the Company were fortunate enough to secure land close to the main line of the North Staffordshire Railway. The site upon which the holder is to stand was prepared with a thickness of 3 feet of concrete, and above this the first section of the tank had been erected on trestles. Its diameter is 127 feet, and the circumference about 400 feet, the surrounding hedge of steel plates being 4 or 5 feet high. The tank was lowered on to its concrete bed by means of forty screws turned simultaneously at intervals under the direction of the Contractors' foreman, Mr. Gardener. When completed, the tank, which has a flat bottom, will contain about 11,000 tons of water. The foundations were prepared by Mr. T. Godwin, of Hanley.

Reconstruction of the Coventry Gas-Fitting Company.—A meeting of the shareholders of the Coventry Gas-Fitting, Electrical, and Engineering Company was held at the Queen's Hotel, Birmingham, on Monday last week, following meetings of the "A," "B," and "C" debenture holders and creditors, for the purpose of considering a scheme for the reconstruction of the concern, under which it is proposed that a new Company be formed, with a capital of £15,000, in £1 shares. To each shareholder in the old Company who should apply in 28 days from the sanction of the Court being given to the scheme, was to be allotted in respect of each share in the old Company an ordinary share of £1 in the new one, with the sum of 15s. credited as having been paid on such shares; the balance to be paid as the new Company's Board should direct. The new Company proposed to issue mortgage debentures to the amount of £24,000, secured by a trust deed which had been prepared and approved by the Liquidator of the old concern. The latter presided at the meeting, whereat Alderman Andrews supported the scheme, considering that the shareholders could not do better than accept the proposals put forward whereby there was a chance of the Company attaining prosperity. The scheme was unanimously adopted.

Stockton Gas Supply.—Mr. W. Ford, the Gas Engineer to the Stockton Corporation, in the course of his annual report, states that there was a decrease in the manufacture of gas to the extent of 6,417,000 cubic feet, or 1½ per cent., in the past financial year. The unaccounted-for gas amounted to 3½ per cent., against 4½ per cent. in the previous year. The number of gas cooking-stoves let on hire throughout the town is 4403. The profit on the year was £3802, against £4610 in 1899-1900.

Loss on Filey Gas and Water Supply.—At the monthly meeting of Filey District Council last Tuesday, the Water and Gas Managing Committee reported a loss on the year's working of £248 on gas, and £288 on water; and in consequence of this, a rate of 5s. in the pound for the ensuing year was recommended by the Finance Committee. This was the same as last year. The minutes were passed; Mr. Cogill remarking that if it had not been for the loss on the water and gas, the rate would have been 4s. 3d.

Ipswich Water Supply.—Plans prepared by Mr. Hamlet Roberts, Assoc.M.Inst.C.E., Water Engineer to the Ipswich Corporation, for the construction of a new service reservoir, have been submitted to Mr. James Mansergh, President of the Institution of Civil Engineers, who has expressed general approval of them and of the site. The cost of the work will be about £20,000; but before the Corporation apply for the necessary money, an estimate is to be submitted. The water-rental in the year ending the 31st of March was £15,433; and sundry receipts made up £15,605. The expenditure was £6668; the repayments to the consolidated loan fund were £8796; and the balance at the close of the year was £141.

Artesian Water Supply in South Australia.—The "Adelaide Register" says that the Commissioner of Public Works (the Hon. R. W. Foster) has received information of the striking of a valuable artesian supply of water in the dry north-east country. For some time boring has been proceeding on a site on the Yandama Creek, about 40 miles east of the southern end of Lake Callabonna. Some while ago artesian water was reached at a depth of 1566 feet; but boring was continued, and on the 14th of March the Commissioner received a telegram from Mr. A. Wright, Clerk of the Works, stating that at 1600 feet a strong flow was tapped, and that the fresh water was rising to the surface at the rate of 20,000 gallons a day. Further sinking increased the supply to 435,000 gallons. The bore will be continued. This discovery is particularly interesting, and decidedly important, because the bore is the most southern one in South Australia in what is known as the central Australian artesian basin, which extends practically from Yandama Creek to the Gulf of Carpentaria—a distance of about 1000 miles. As the depth at which the water was secured was so considerable, the officials consider this an indication that the artesian area extends much farther southward, towards Lake Frome, and that a flow may possibly be secured at Lake Elder and Lake Boolka. The result is particularly gratifying to the department, as it entirely bears out the correctness of the official forecast that water would be struck within 50 feet of the depth at which it was met.

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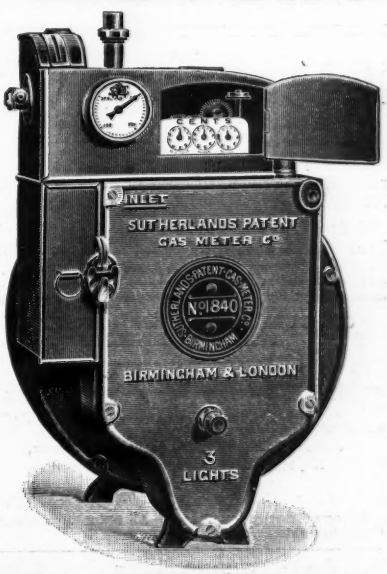

THE SUTHERLAND GAS-METER COMPANY

ESSEX WORKS, BIRMINGHAM.

Further Increase in the Price of Manchester Gas.—The Gas Committee of the Manchester Corporation last Friday considered the question of further increasing the price of gas. The matter was brought forward as the result of the mandate of the City Council, at their meeting on the 1st inst. (*ante*, p. 1244), that the Committee should so amend their estimates as to provide a contribution of £50,000 during the coming financial year in aid of the rates. After a long discussion, it was decided by resolution to recommend the Council to increase the price of gas in the city from 2s. 6d. to 2s. 9d., and to consumers in the out-districts from 2s. 9d. to 3s. per 1000 cubic feet.

Fylde Water Supply.—The following figures have been issued by the Fylde Water Board: The number of consumers on the books at the close of the past financial year, was 21,082, an increase of 1037 during the twelve months. In the past ten years the number has risen by 10,230, so that last year the annual average increase was fully maintained. The expenditure on capital account during the year was £18,380, of which £10,700 was for the new 15-inch main which is being laid from the Weston reservoir to Lytham. On revenue account the figures for the year are as follows: Net receipts, £49,976; working expenses, rates, rents, &c., £8772; balance, £41,204. This was disposed of as follows: Dividend, interest, and income-tax, £29,292; contribution to the sinking fund, £9373; net profit for the year, £2539.

Lyons Water Supply.—Until recent years, the water supply of Lyons was obtained from the right banks of the Rhône; but the ever-increasing needs of the population made it requisite to carry out a new system of distribution on the left bank of the river. It comprises 38 impounding wells, built of cement concrete, located about 22 yards apart, and the same distance from the river wall. These wells are connected with the pumping works by means of two mains, which, owing to the difficulties met with, are of the syphon type. The quantity of water to be supplied is 11 million gallons per 24 hours. There are five steam-pumps and five boilers. Each of the latter is semi-tubular with a heater; the total heating surface being 2045 square feet. The motors are horizontal and condensing; the pumps, double-acting, of the Girard type. The consumption of coal (15 per cent. cinders) does not exceed 2 lbs. per horse-power-hour in water pumped. The total cost was £135,514, in which amount £8670 was for wells, £39,477 for pumps, £61,770 for pipes, and about £20,000 for the reservoir and annexes.

Buenos Ayres (New) Gas Company, Limited.—In the report to be presented to the shareholders of this Company next Thursday, the Directors state that the profit for the past year amounts to £41,645. After payment of the fixed charges, making provision for bad and doubtful debts, and writing off the balance of the cost of the water-gas plant, as well as a proportion of the discount and expenses of the issue of debenture stock, there remains £32,232 to be dealt with. From this amount £10,000 has already been paid to the shareholders as an interim dividend; and the Directors recommend a final dividend of 8s. per share, free of income-tax—making 6 per cent. for the year, and leaving £2232 to be carried forward. The expenses incurred during the past twelve months in connection with the introduction of stoves for cooking and heating purposes have been charged against revenue. The new benches of inclined retorts which have been erected, and which work most satisfactorily, were not available for use until July. The Company therefore did not derive any advantage from their installation until late in the Argentine winter.

The inhabitants of Finchley, Hendon, and Mill Hill should not neglect to carefully peruse a leaflet, setting forth the comparative cost of gas and electricity, which has been issued by Mr. C. H. Rutter, Engineer and General Manager of the North Middlesex Gas Company, if they wish for some pertinent facts, supported by reliable figures, in regard to the relative merits of the two illuminants.

At their meeting last Tuesday, the Water Committee of the Bolton Corporation voted £14,000 profit in relief of the rates.

The Batley Corporation have placed an order for purifier extensions, re-arrangement of connections, &c., with Messrs. R. Dempster and Sons, Limited, of Elland.

The Local Government Board have sanctioned the borrowing by the Burton-upon-Trent Corporation of £20,969 for gas-meters and cooking-stoves, and £1111 for additions to the gas-works.

The net profits of the gas undertaking of the Wigan Corporation for the past financial year amounted to £11,000, notwithstanding that between £7000 and £8000 more was paid for coal than in the preceding twelve months.

The Leeds Fire-Clay Company, Limited, have received a repeat order for a shallow regenerator setting at the Leatherhead Gas-Works. They have also received orders for similar settings at the Portland, Reigate, and Hornsea works.

Messrs. R. Dempster and Sons, Limited, of Elland, have secured the order for the telescopic gasholder and tank 102 feet in diameter and 24 ft. 6 in. deep, for which tenders were invited by the Buxton Corporation in the "JOURNAL" for the 12th of March.

The ratepayers of Tunbridge Wells have been saved an expenditure of £100,000 on the improvement of their water supply by the successful sinking of artesian wells at Pembury, at a cost of £30,000. Four wells at this place are yielding on an average a million gallons of excellent water per diem.

The report presented at the eleventh annual meeting of the Southampton Free Labour Association, of the Employers' Committee of which Mr. S. W. Durkin, Engineer and Manager of the Southampton Gas Company, is a member, sets forth that in the past year the benefit funds again showed satisfactory progress. The figures given represented the small pence contributions of the members paid week by week; and the Secretaries thought the result was gratifying—showing a growing appreciation of the funds.

The want of a reliable apparatus at a reasonable price, for indicating in the office of the Engineer or principal the exact height of the water in a distant reservoir or tank, has been long felt in the large institutions which are to-day fitted with modern fire and hydraulic appliances. Many ordinary mechanical devices are already in use; but these only indicate to an observer in the immediate vicinity of the tank. What is needed is something enabling the Engineer or Superintendent to see, without leaving his office, what is the exact quantity of water in a reservoir, and whether the necessary pumping is being, or has been, done regularly. It is claimed for the water-level indicator devised by Messrs. Gent and Co., of Leicester, that it performs this function, and that by it weekly or daily diagrams can be automatically drawn, showing the depth of water at any moment during the day or week. The firm issue a small pamphlet describing the appliance.

Last Wednesday, at the invitation of Mr. H. A. Willey, the Directors of the Bristol Gas Company paid a visit to Exeter for the purpose of inspecting the works of his firm. The company also included the Right Worshipful the Mayor and the Sheriff of Exeter. The party were conducted over the extensive establishment by Mr. Willey, Mr. Sidney Willey, his brother, and Mr. Simpson. At the conclusion of the inspection, the visitors expressed themselves highly pleased with what they had seen, and complimented Mr. Willey on his enterprise; especially commending the high-class machinery and appliances, which render the establishment unique in the West of England. The company also visited the Cathedral and the Guildhall. A dinner was afterwards held at the New London Hotel—Mr. Willey occupying the chair. Among the toasts was "The Bristol Gas Company," to which Mr. J. W. S. Dix, the Chairman of the Company, responded, and proposed "The Health of the Chairman," which was acknowledged by Mr. Willey.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

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FIRST-CLASS Representative wanted, able to Organize and Develop Business. Must be fully Qualified and Experienced.
Apply, by letter, to No. 3684, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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Apply, with References, to Mr. C. MEIKLEJOHN, Engineer and Manager, Gas Company, RUGBY.

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WANTED, by a Provincial Gas Company, Two good GAS-FITTERS, used to the whole routine of Iron, Compo., Stoves, Incandescent Burners, and Fittings. Must be first-class Hands.
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For further Information and *copies* of References, &c., apply to H. HOARE, care of Mr. W. King, 11, Bolt Court, FLEET STREET, E.C.; or H. HOARE, Gas Engineer, Cotteslow, near Perth, WEST AUSTRALIA.

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Particulars may be obtained of the undersigned.
Sealed Tenders to be delivered to me on or before the 3rd of June prox.
The lowest Tender will not necessarily be accepted.
Dated this 11th day of May, 1901.
GEO. H. GISBY,
Secretary.
Ware, Herts.

TENDERS FOR GAS COAL.
THE Magistracy of Copenhagen are prepared to receive TENDERS for the supply and delivery of 90,000 Tons of best GAS COAL from medio June, 1901, until the end of December, 1901.
The Magistracy reserve the right to divide the Contracts between two or more Contractors.
Further Information and Conditions for the delivery may be obtained on application to Kôbenhavns Belysningsvœsen, Vestre Boulevard, Kôbenhavn B.
The Tenders, sealed and marked "Tilbud paa Kul," to be sent to Magistratens, 4de Afdeling, Lavendelstrœde 1, Kôbenhavn K, before the 29th of May, 1901, Twelve o'clock, at which time the Tenders will be opened in the presence of the parties tendering who are in attendance.
THE MAGISTRACY OF COPENHAGEN.
May 10, 1901.

BOROUGH OF MORLEY.
(GAS DEPARTMENT.)
THE Gas Committee are prepared to receive TENDERS for the supply of 12,000 Tons of best GAS COAL during the Twelve Months ending June 30, 1902.
Forms of Tender and further Particulars may be obtained on application to H. J. Hemingway, Town Hall, Morley.
Tenders, endorsed "Tender for Coal," must be sent to the Town Clerk, Town Hall, Morley, not later than Saturday, May 18.
R. BOROUGH HOPKINS,
Town Clerk.
Morley, May 10, 1901.

ULVERSTON URBAN DISTRICT COUNCIL.
TO TAR DISTILLERS.
THE Gas and Water Committee are prepared to receive TENDERS for the purchase of the surplus TAR produced at their Gas-Works during the Year commencing the 1st of July next.
Further Particulars and Forms of Tender may be had on application to the undersigned.
Sealed Tenders, endorsed "Tender for Tar," addressed to the Chairman of the Gas and Water Committee, to be sent in not later than Thursday, the 30th inst.
The Committee do not bind themselves to accept the highest or any Tender.
JNO. SWAN,
Engineer and Manager.
Gas-Works, Ulverston,
May 10, 1901.

ULVERSTON URBAN DISTRICT COUNCIL.
TENDERS FOR COAL.
THE Gas and Water Committee are prepared to receive TENDERS for the supply of Best Screened GAS COAL during the ensuing Year, commencing the 1st of July next.
Parties tendering must give full Particulars of the Coal they propose to supply, and name the Pit from which the same will be raised.
Further Information and Forms of Tender may be obtained on application to the undersigned.
Sealed Tenders, endorsed "Tender for Coal," and addressed to the Chairman of the Gas and Water Committee, to be sent in not later than Thursday, the 30th inst.
The Committee do not bind themselves to accept the lowest or any Tender.
JNO. SWAN,
Engineer and Manager.
Gas-Works, Ulverston,
May 10, 1901.

CITY OF LEEDS.
(GAS DEPARTMENT.)
TENDERS required as below:—
For CRAVEN or DERBYSHIRE LIME.
For Wrought-Iron TUBES.
For Pressed and Common RED BRICKS.
For 2½-in., 3-in., and 4-in. Self-faced BRADFORD or HALIFAX FLAGS.
Forms of Tender may be obtained on application to the undersigned.
Endorsed Tenders, addressed to the Chairman of the Gas Committee, Municipal Buildings, Leeds, will be received not later than Tuesday, the 21st inst.
The Committee do not bind themselves to accept the lowest or any Tender.
R. H. TOWNSLEY,
General Manager.
Gas Offices, Leeds,
May 6, 1901.

CITY OF LEEDS.
(GAS DEPARTMENT.)
TENDERS FOR COKE-CONVEYING PLANT.
THE Gas Committee of the Leeds Corporation are prepared to receive TENDERS for the supply of COKE-CONVEYING and STORAGE PLANT for the New Wortley Gas-Works.
Further Particulars can be obtained on application to the undersigned.
Tenders, suitably endorsed, and addressed to the Chairman of the Gas Committee, Municipal Buildings, Leeds, will be received not later than Monday, the 20th inst.
The Committee do not bind themselves to accept the lowest or any Tender.
R. H. TOWNSLEY,
General Manager.
Gas Offices, Leeds,
May 6, 1901.

CITY OF LEEDS.
(GAS DEPARTMENT.)
GAS-WORKS PLANT.
THE Gas Committee of the above Corporation are prepared to receive TENDERS for the supply of the following PLANT required at their Meadow Lane Works:—
1. RELIEF GASHOLDER.
2. OIL STORAGE TANK.
3. STATION METER.
4. STEAM BOILERS and FITTINGS of either the Lancashire or Tubular Type.

Full Particulars can be obtained on application to the undersigned.
Tenders, suitably endorsed, and addressed to the Chairman of the Gas Committee, Municipal Buildings, Leeds, will be received not later than Monday, the 20th inst.
The Committee do not bind themselves to accept the lowest or any Tender.
R. H. TOWNSLEY,
General Manager.
Gas Offices, Leeds,
May 10, 1901.

GLOUCESTER GASLIGHT COMPANY.

TENDERS FOR GAS COAL.

THE Directors of the above Company invite TENDERS for the supply of about 33,000 Tons of GAS COAL for One Year from the 1st day of July next, in such monthly quantities as may be required by the Company.

Tenders to state the price delivered at the Midland Railway Sidings, Hempsted, near Gloucester, or the Great Western Railway Wharf, Llanthony, Gloucester; or if sent (as preferred) by Water, the price f.o.b., and also the price delivered at the Gas Company's Wharf on the Gloucester and Berkeley Canal.

Further Particulars and Forms of Tender may be obtained of the undersigned.

Sealed Tenders, endorsed "Tender for Coal," specifying the description and quality of the Coal, to be addressed to the Chairman, Gas Offices, Eastgate Street, Gloucester, and delivered not later than the 4th day of June next.

The Directors reserve to themselves the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any Tender.

By order,
WILLIAM E. VINSON,
Secretary.

Gas Offices, Gloucester,
May 2, 1901.

PONTYPRIDD URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the following, supplied and erected at their Treforest Gas-Works.

CONTRACT No. 1.—One COMBINED ENGINE and EXHAUSTER, to pass 25,000 cubic feet per hour.

CONTRACT No. 2.—One CORNISH BOILER, 18 ft. long by 6 ft. diameter.

CONTRACT No. 3.—One THROUGH BED of 8 RETORTS (16 Mouthpieces), with Regenerative Firing.

CONTRACT No. 4.—Five HOPPERED BOTTOM COAL-WAGGONS, to load 8 or 10 Tons.

Specifications may be seen (or copies obtained on payment of 10s. 6d.), and Form of Tender and all Particulars obtained from the undersigned, at the Gas Offices, Treforest.

Sealed Tenders, endorsed, to be addressed to C. Sydney-Watson, Esq., Clerk to the District Council, Pontypridd, and delivered not later than noon May 21, 1901.

The Committee do not bind themselves to accept the lowest or any Tender.

EDW. JONES,
Engineer and Manager.

Gas Offices, Treforest,
Glam.

TO TAR DISTILLERS AND OTHERS.

THE Corporation of Birkenhead invite OFFERS for the Purchase and Removal of the SURPLUS TAR produced at their Gas-Works during a period of One, Three, or Five Years, commencing on the 1st of July, 1901.

Deliveries will be made at the Gas-Works either into Contractor's Tanks on the Gas-Works Railway Siding or into Tanks for conveyance by Road to Boats.

The Contractor whose Tender is accepted will be required to enter into a formal Contract or Agreement with the Corporation, upon the specific Terms and Conditions contained in the Draft Contract which has been prepared by the Town Clerk, and deposited in his Office for inspection.

Forms of Tender and further Particulars may be obtained from the Gas Engineer, Mr. T. O. Paterson, C.E., Gas-Works, Thomas Street.

Tenders, which must be on the printed form supplied, sealed and endorsed "Tender for Tar," to be sent in to me not later than Five p.m. on Thursday, the 23rd of May, 1901.

The Corporation do not bind themselves to accept the highest or any Tender.

By order,
ALFRED GILL,
Town Clerk.

Town Hall, Birkenhead,
May 10, 1901.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Corporation of Birkenhead are prepared to receive TENDERS for the Supply of COAL, COAL NUTS, THRO' and THRO' CANNEL, and CANNEL NUTS for Gas-Making Purposes, for a period of Twelve Months, commencing from the 1st of July, 1901.

Forms of Tender, together with any further Information, may be obtained from Mr. T. O. Paterson, C.E., Gas Engineer, Gas-Works, Birkenhead.

Tenders (accompanied by copy of recent Analysis), stating the price per Ton, delivered on to the Gas-Works Railway Siding, must be sent in to me, sealed and endorsed "Tender for Gas-Works Coal," not later than Five o'clock in the Afternoon of Thursday, the 23rd of May, 1901.

Also for a supply of STEAM COAL and SLACK, to be delivered at the Pumping-Stations of the Spring Hill, Flaybrick Hill, Borough Road, Mount Road, and the Ford Water-Works, for a period of Twelve Months, commencing from the 1st of July, 1901.

Forms of Tender, together with any further Information, may be obtained from Mr. W. A. Richardson, C.E., Water Engineer, Town Hall, Birkenhead.

Tenders, stating the price per ton delivered at the various Pumping-Stations, must be sent in to me, sealed and endorsed "Tender for Water-Works Coals," not later than Five o'clock in the Afternoon of Thursday, the 23rd of May, 1901.

All deliveries to be made from time to time according to the requirements of the respective Engineers.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
ALFRED GILL,
Town Clerk.

Town Hall, Birkenhead,
May 10, 1901.

THE East Dereham Urban District

Council are prepared to receive TENDERS for the supply of about 1350 Tons of screened GAS COAL for the ensuing Year.

Conditions and Forms of Tender to be had of the undersigned.

Tenders, marked "Coals," to be sent in by the 3rd of June, to

B. H. VORES,
Clerk to the Urban District Council.

East Dereham.

BOROUGH OF BARROW-IN-FURNESS.

SUPPLY OF COAL AND CANNEL.

THE Corporation are prepared to receive TENDERS, on Forms to be obtained at the Office of the Gas and Water Manager, for the supply of screened GAS COAL and CANNEL for the Year ending the 30th of June, 1902.

Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Coal," to be delivered at the Town Clerk's Office, not later than Twelve o'clock noon on Wednesday, the 22nd day of May, 1901.

The lowest or any Tender not necessarily accepted.

By order,
C. F. PRESTON,
Town Clerk.

Town Clerk's Office, Town Hall,
Barrow-in-Furness, May 8, 1901.

BOROUGH OF DARWEN.

THE Corporation are prepared to receive TENDERS for all the surplus GAS TAR produced at their Gas-Works for One Year.

Also for the supply of the following GOODS for One Year:—

1. OILS and PAINTS.
2. VITRIOL.
3. WROUGHT-IRON TUBES and FITTINGS.
4. BRASS FITTINGS.
5. LEAD PIPE.
6. GAS-METERS.

Particulars as to quantities may be obtained on application to Mr. A. H. Smith, Gas Engineer, Darwen.

Sealed and endorsed Tenders must be delivered to the undersigned at or before noon on Thursday, May 23.

No Tender necessarily accepted.

By order,
WILLIAM P. HALLIWELL,
Town Clerk.

Town Clerk's Office,
May 7, 1901.

SHREWSBURY GASLIGHT COMPANY.

TENDERS FOR COAL.

THE Directors of the Shrewsbury Gaslight Company, invite TENDERS for the supply of about 16,500 Tons of screened GAS COALS, to be delivered free at the Great Western or London and North-Western Goods Yard, Shrewsbury, during the Year, commencing July 1, 1901, and ending June 30, 1902.

The Directors reserve to themselves the right to divide the quantity into two or more Contracts, and do not bind themselves to accept the lowest or any Tender.

Tenders must be made on Forms (containing further Particulars) which may be obtained on application at the Company's Works, or by post, and must be sent to the undersigned, on or before the 15th day of June, 1901.

By order,
WM. BELTON, Assoc.M.Inst.C.E.,
Engineer, Secretary, and Manager.

Gas-Works, Shrewsbury,
May 7, 1901.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

TO PIPE FOUNDERS.

THE Gas Commissioners are prepared to receive TENDERS for the supply and delivery of 30-inch diameter CAST-IRON MAIN PIPES, CONNECTIONS, and SPECIALS, at their new Gas-Works, Granton, near Edinburgh.

Specifications, Schedules, and Forms of Tender may be obtained upon application to the Chief Engineer and Manager, Mr. W. R. Herring, Gas-Works, New Street, Edinburgh.

Tenders to be lodged with the undersigned on or before Monday, the 27th day of May, 1901, at Ten a.m., endorsed "Tender for Main Pipes."

The Commissioners do not bind themselves to accept the lowest or any Offer.

JAMES M'G. JACK,
Clerk.

25, Waterloo Place, Edinburgh,
May 7, 1901.

ALTRINCHAM GAS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS for the following—

CONTRACT No. 2. ANNULAR CONDENSERS and Sundry 20-inch CAST-IRON PIPES.

CONTRACT No. 3. TOWER SCRUBBER.

CONTRACT No. 4. PURIFIERS & ACCESSORIES.

The Specification and Drawings may be seen on application to Mr. J. E. Lamb, Manager, Gas Offices, Altrincham; and at the Offices of Messrs. Thomas Newbigging and Son, Engineers, 5, Norfolk Street, Manchester.

Bills of Quantities and Forms of Tender may be obtained from the latter on payment of Three Guineas, which will be returned on receipt of a *bonâ-fide* Tender.

Sealed Tenders to be addressed to the Chairman, Gas Company, Altricham, and sent so as to reach me not later than Ten a.m. on Wednesday, the 22nd of May, 1901.

The lowest or any Tender not necessarily accepted.

F. R. B. LINDSELL,
Secretary.

Gas Offices, Altrincham,
May 8, 1901.

THE Leigh-on-Sea Urban District

Council invite TENDERS for the supply of 700 Tons of good GAS COAL, to be delivered at the Gas-Works Wharf, Leigh-on-Sea, as required, in quantities of not more than 80 Tons.

Tenders to be sent to the Council Offices on or before May 21, at Eight p.m.

A. T. ARTHY,
Clerk.

BLACKPOOL CORPORATION.

THE Gas Committee are prepared to receive TENDERS for the supply of about 40,000 Tons of COAL for the ensuing Year from June 1, to June 1, 1902.

Tenders, endorsed, must be addressed to the Chairman by the 23rd day of May.

Forms of Tender and Particulars may be had from the undersigned.

JOHN CHEW,
Gas Engineer.

Corporation Gas-Works,
Princess Street, Blackpool,
May 10, 1901.

BOROUGH OF WORKINGTON.

THE Gas Committee invite Tenders for the supply and erection of IRONWORK required in the extension of Retort-House Roof.

Copy of Specification, &c., can be obtained from Mr. G. Keyte, Engineer and Manager, to the Gas Department upon application accompanied by a deposit of Five Shillings, which will be returned upon receipt of a *bonâ-fide* Tender.

Tenders must be forwarded, addressed to the Chairman of the Gas Committee, on or before Monday, May 20.

By order, JOHN WARWICK,
Town Clerk.

THE Stretford Gas Company are prepared to receive TENDERS for the surplus GAS TAR and AMMONIACAL LIQUOR produced at their Works (together or separately) for a period of One Year commencing July 1, 1901. The Directors are prepared to make the Contract on the Sliding-Scale Basis for Liquor and of a fixed Price per ton for Tar.

Tenders to be sent in, addressed to the Chairman, and endorsed "Tender for Tar, &c.," on or before Tuesday, May 21, 1901.

The Directors do not bind themselves to accept the highest or any Tender.

BENJAMIN HAYNES,
Secretary.

TENDERS FOR GAS COAL.

THE Directors of the Windsor Royal Gaslight Company invite TENDERS for 9800 Tons of High-Class GAS COAL, with option of taking 100 Tons per month in addition; and also 150 Tons of New Boghead CANNEL in small quantities as required, to be delivered free to the Great Western Railway Station at Windsor during the Twelve Months ending the 31st of July, 1902.

Deliveries to be made in such quantities and at such times as may be required by the Company.

Sealed Tenders, endorsed "Tender for Coal," to be sent by post to reach the undersigned by Tuesday morning, the 4th of June. Forms of Tender not supplied.

The Directors do not bind themselves to accept any Tender.

By order,
JOHN HENRY STRANGE,
Secretary.

2, Victoria Street, Windsor,
Berks, May 7, 1901.

TENDERS FOR GAS COAL.

THE Directors of the Watford Gas and Coke Company invite TENDERS for the supply during the Twelve Months from the 1st day of July, 1901, to the 30th day of June, 1902, of 9000 Tons (more or less) of GAS COAL, screened or unscreened, to be delivered at the Bushey Station of the London and North-Western Railway.

Forms of Tender and all Information may be obtained, on application in writing only, of me the undersigned.

Tenders to be delivered on or before the 10th day of June, 1901, addressed to the Chairman of the Watford Gas and Coke Company, Watford, endorsed "Tender for Gas Coal."

Tenders must be on the Form supplied, any alteration of which will invalidate the Tender.

The Directors do not bind themselves to accept any Tender.

J. DUNCAN ROYAL,
Secretary.

Watford Gas and Coke Company's Offices,
Watford, May 10, 1901.

RAMSGATE CORPORATION.

(GAS, WATER, AND ELECTRICITY DEPARTMENT.)

THE Gas, Water, and Electricity Committee invite TENDERS for the supply of best quality, soft caking, and gas-producing screened DURHAM or OTHER COAL in three annual quantities of 21,000, 22,000, and 23,000 Tons, delivered free into Carts on the Quay of Ramsgate Harbour. The first quantity of 21,000 Tons to be delivered in equal monthly quantities between the 1st of July, 1901, and the 30th of June, 1902; the second and third years supplies also in equal monthly quantities between the 1st of July, 1902, and the 30th of June, 1903, and the 1st of July, 1903, and the 30th of June, 1904. A distinct price to be named for each annual quantity.

Tenders to be sent in not later than Saturday, June 1, addressed to the Chairman of the Gas, Water, and Electricity Committee, Boundary Road, Ramsgate, endorsed "Coals."

The Committee do not bind themselves to accept the lowest or any Tender.

Full Particulars and Form of Tender on application to

WILLIAM A. VALON,
Engineer.

LICHFIELD GAS COMPANY.

TENDERS FOR COAL.

THE Directors of the above Company invite TENDERS for the supply of portions of 5000 Tons of best screened GAS COAL, to be delivered as required during the Twelve Months commencing July 1, 1901, at the Company's Works or Lichfield City Station. Equal weekly quantities can be received over the whole Twelve Months.

Forms of Tender, and any other Information supplied on application, in writing only, to the undersigned.

Tenders, to be endorsed and addressed through the Post to H. M. Morgan, Esq., Chairman, Gas Office, Lichfield, Staffs., not later than June 1, 1901.

FREDERICK KEY,
Engineer and Manager.

Lichfield, May 11, 1901.

LICHFIELD GAS COMPANY.

TENDERS FOR TAR AND AMMONIACAL LIQUOR.

THE Directors of the above Company invite TENDERS for the purchase of the surplus TAR and LIQUOR that they will have for disposal during the Twelve Months commencing July 1, 1901—namely, about 290 Tons of the former, and 580 Tons of the latter—to be delivered into Purchaser's Cart-Barrels at the Gas-Works, Queen Street.

No Forms of Tender supplied.

Tenders, to be endorsed and addressed through the Post to H. M. Morgan, Esq., Chairman, Gas Office, Lichfield, Staffs., not later than June 1, 1901.

FREDERICK KEY,
Engineer and Manager.

Lichfield, May 11, 1901.

MARKET HARBOROUGH URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

TO SULPHURIC ACID MAKERS.

THE Gas Committee of the above Council are prepared to receive TENDERS for the supply of SULPHURIC ACID during the Twelve Months ending the 31st of May, 1902.

Particulars may be obtained from the undersigned, to whom sealed Tenders, endorsed "Tender for Acid," must be delivered on or before the 24th inst.

A. T. HARRIS,
Engineer and Manager.

Gas Offices: St. Mary's Road,
Market Harborough, May 3, 1901.

MARKET HARBOROUGH URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL.

THE Gas Committee of the above Council are prepared to receive TENDERS for the supply of 3500 Tons of best screened GAS COAL or NUTS, to be delivered Market Harborough Station as may be required during the Year ending the 31st of May, 1902.

The Committee reserve the right to accept Tenders for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

Forms of Tender and any further Information may be obtained on application to the undersigned, to whom sealed Tenders, endorsed "Tender for Coal," must be delivered on or before the 24th inst.

A. T. HARRIS,
Engineer and Manager.

Gas Offices: St. Mary's Road,
Market Harborough, May 3, 1901.

COUNTY BOROUGH OF BURTON-UPON-TRENT.

TO COLLIERY PROPRIETORS.

THE Gas and Electric Light Committee invite TENDERS for the supply of COAL and CANNEL for their Gas-Works. The approximate quantities required during the Twelve Months from the 1st of July will be: Best Gas Coal, 35,000 Tons; Cannel, 5000 Tons.

It is requested that Tenderers should offer these quantities or part thereof (the deliveries to extend over the Twelve Months named), and also proportions thereof for Three, Six, and Nine Months.

Forms of Tender and Conditions of Supply may be obtained from the undersigned, to whom Tenders, endorsed "Coal," must be delivered on or before Wednesday, the 29th day of May, 1901.

The Committee do not bind themselves to accept any Tender.

F. L. RAMSDEN,
Manager and Engineer.

The Gas and Electric Light Works,
Burton-upon-Trent, May 1, 1901.

MOUNTAIN ASH URBAN DISTRICT COUNCIL.

(GAS-WORKS.)

TO BUILDERS AND IRON FOUNDERS.

THE Council invite Tenders for Extensions at their Penrhiwceiber Gas-Works under two Contracts—

Contract No. 2 being for the erection of THREE OVENS of Six Retorts and firing on Hislop's Shallow Chamber Regenerative System.

Also Contract No. 3 for the BENCH and RETORT MOUNTINGS required.

Drawings and Specifications may be seen, and Form of Tender obtained, on and after the 9th inst., at the Office of Mr. John Williams, Town Hall, Mountain Ash, on payment of Two Guineas in each case, which will be returned on receipt of *bonâ-fide* Tenders.

Sealed Tenders, to be sent to the undersigned, on or before the 21st of May, and endorsed "Gas Extensions, Contract No. 2," and "Gas Extensions, Contract No. 3," respectively.

By order,
H. P. LINTON,
Clerk to the Council.

Town Hall, Mountain Ash,
May 1, 1901.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY.

400 £10 ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, the 4th of June, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

LOWESTOFT WATER AND GAS COMPANY.

NEW ISSUE OF £1300 FOUR PER CENT. PERPETUAL DEBENTURE STOCK, AND 400 £10 ORDINARY SHARES.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, June 4, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

MORTGAGEES' SALE.

IMPORTANT TO MANUFACTURING CHEMISTS AND OTHERS.

TO BE SOLD, the Lessee's interest in the Buildings, Lands, and Premises, containing about 1½ acres, known as LITTLE ISLAND CHEMICAL WORKS, Co. Cork, together with the Machinery, Fixtures, and Plant attached thereto.

The Premises are situate on the Shore of the River Lee, about 5 miles from the City of Cork. There is a private Wharf where Vessels can load at the very door of the Factory. The business of manufacturing Aniline Dyes, Creosote, Pitch, &c., from Coal Tar has been for some Years, and is still, carried on at these premises.

For further Information, apply to GREGG, JERMYN, AND SONS, Solicitors, CORK.

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Shareholders of the above Company will be held at the Offices of the Company, 30, Gracechurch Street, in the City of London, on Tuesday, the 28th day of May next, at Three o'clock in the afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 31st day of December last, to elect Directors and an Auditor in place of those retiring by rotation, and to transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 15th inst. to the 28th inst., both inclusive.

By order of the Board,
SAMUEL WOOD,
Secretary.

Offices: 30, Gracechurch Street,
London, May 2, 1901.

Foolscap 4to, pp. 535, with 239 Illustrations and Steel Plate Engraving (as Frontispiece) of WILLIAM MURDOCH, *Inventor of Gas Lighting. Morocco Gilt, 21s.; Roan Gilt, 18s.*

THE SIXTH (AND CENTENARY) EDITION OF THE

HANDBOOK

FOR

GAS ENGINEERS AND MANAGERS.

BY

THOMAS NEWBIGGING,

M.Inst.C.E.

LONDON:

WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

BOROUGH OF TORQUAY.

THE Gas-Works Committee of the Torquay Town Council are prepared to receive TENDERS for the supply of 1200 Tons of approved GAS COALS, delivered free into Stores at the St. Mary Church Gas-Works.

Further Particulars and Forms on which Tenders must be submitted may be obtained at my Office.

Sealed Tenders, endorsed "Tender for Gas Coals," to be sent to the undersigned not later than 9.30 a.m., on Thursday, May 23, 1901.

The lowest or any Tender will not necessarily be accepted.

FREDK. S. HEX,
Town Clerk.

Town Hall, Torquay,
April 30, 1901.

IMPERIAL CONTINENTAL GAS ASSOCIATION.

(INCORPORATED BY ACT OF PARLIAMENT.)

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Association was held at the City Terminus Hotel, Cannon Street, London, on Tuesday, the 7th inst.,

THOMAS HENRY GOODWIN NEWTON, Esq., in the Chair, when the following RESOLUTIONS were unanimously passed:—

"That the Report of the Directors upon the affairs of the Association be received, adopted, and entered upon the Minutes."

"That a Dividend of 5 per cent. for the Half Year ended the 31st of December last be declared upon the £3,800,000 Capital Stock of the Association, and that the same be payable, free of Income-Tax, on and after the 14th inst."

"That Thomas Henry Goodwin Newton, Esq., be re-elected a Director of the Association."

"That Colonel Josiah Wilkinson, be re-elected a Director of the Association."

"That Arthur Lucas, Esq., C.E., be re-elected a Director of the Association."

"That Sir Joseph Sebag Montefiore be re elected an Auditor of the Association."

Votes of Thanks were passed to the Directors for their able management of the affairs of the Association, to the Chairman for his conduct in the Chair, and to the Staff in London and on the Continent.

By order of the Board,
ROBERT W. WILSON,
Secretary.

No. 21, Austin Friars, London, E.C.,
May 8, 1901.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

ALL PARTS FOR

GAS-METERS,

INDICES, CRANKS, WORMS, &c.

PREPAYMENT ATTACHMENTS.

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Tourtel Manufacturing Co., Ltd.,

146A, QUEEN VICTORIA STREET, E.C.

JAMES OAKES & CO.

ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

Demy Octavo, 172 Pages, Bound in Dark Blue Cloth, Lettered, Price 6s., post free,

"POWERS OF CHARGE"
of the
METROPOLITAN GAS COMPANIES.
By
LAURENCE W. S. ROSTRON,
M.A., B.C.L.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

COKE-BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT)
With Elevators and Conveyors worked by Steam or Gas Engine.
GEORGE WALLER & CO.,
165, QUEEN VICTORIA STREET, E.C.;
And at STROUD, GLOUCESTERSHIRE.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH N.B.

HYDRAULIC BLOWER
For blowing Air into Gas Purifiers for the purpose of
REVIVIFYING
THE FOULED OXIDE.
Full Particulars on application.
LUXWERKE LUDWIGSHAFEN AM RHEIN.

HOLMSIDE
GAS COALS.
Present Daily Produce over 5000 Tons.
Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . . 11,205 Cubic Feet.
Illuminating Power 16 1/10 Stand. Sperm Candl.
Coke (of good & pure quality) 13¾ Cwt. per Ton.
Sulphur . . . . . A little over 1 per Cent.
Ash . . . . . Under 1 per Cent.
Tar . . . . . 163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor 103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR
PELTON GAS COALS.
Present Daily Produce available 3000 Tons.
Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.
Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.
These Coals may be bought through the Principal Merchants in England, or direct from
MR. MARK ARCHER,
HOLMSIDE & SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

NITRATE of Thorium and Cerium.
FABRIK CHEMISCHER PRAEPARATE VON STRAMER, NOACK, AND CO., HAMBURG.

DISPENSE WITH CANNEL COAL
and
INCREASE YOUR ILLUMINATING POWER
by using the
WHESSOE-MUNICH BENZOL CARBURETTER
The Cheapest and Best in the Market.
The Managers of Tynemouth, Middlesbrough, and Darlington Gas-Works are much pleased with it, and would not be without it.
Apply to the Sole Makers:
THE WHESSOE FOUNDRY COMPANY, LIMITED,
DARLINGTON.

HEATHCOTE GAS COAL.
Rich in Illuminating Power and Yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.
THE GRASSMOOR CO., LD.,
CHESTERFIELD.

CRESSWELLS' ASBESTOS CO., LTD.
WELLINGTON MILLS
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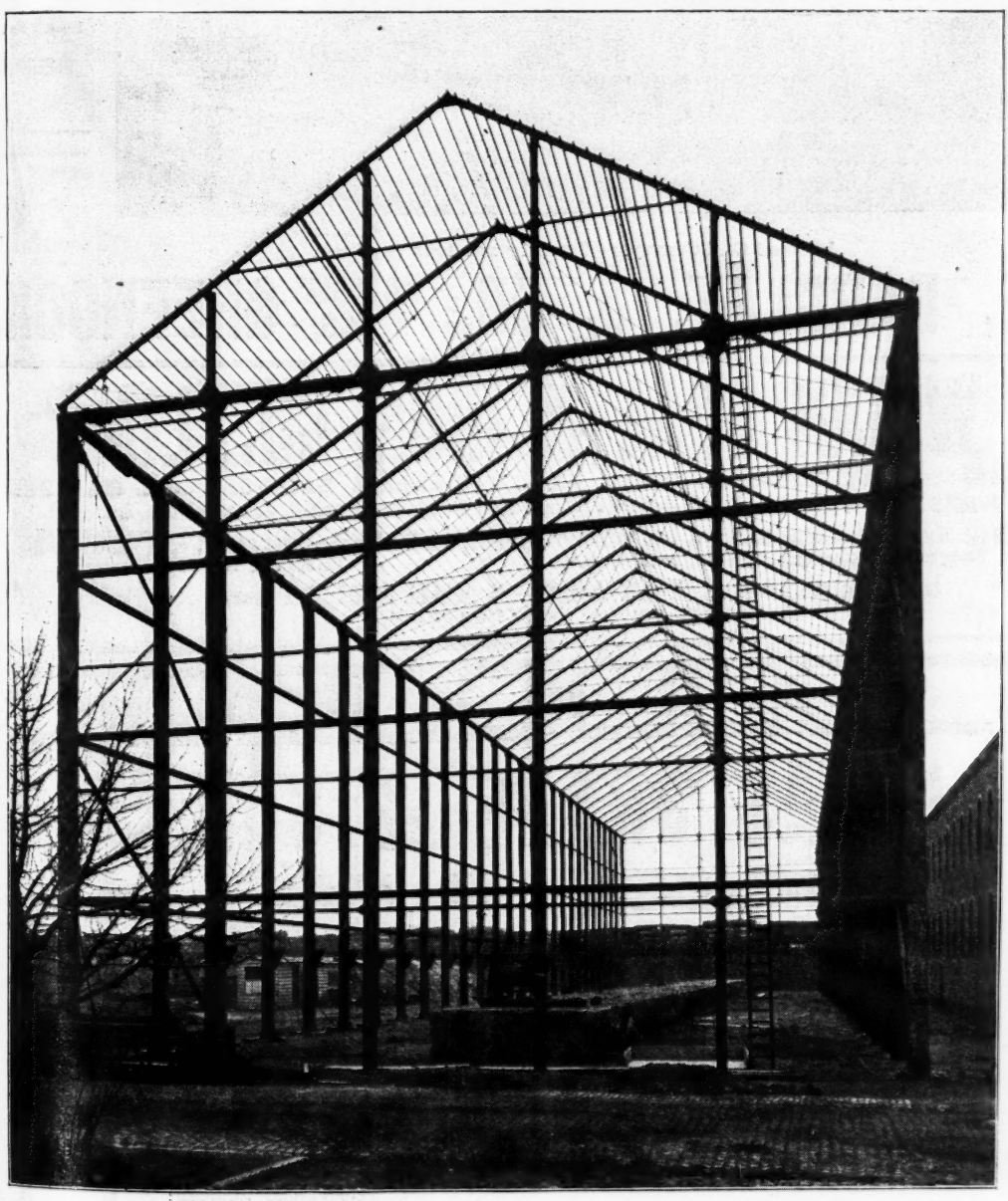

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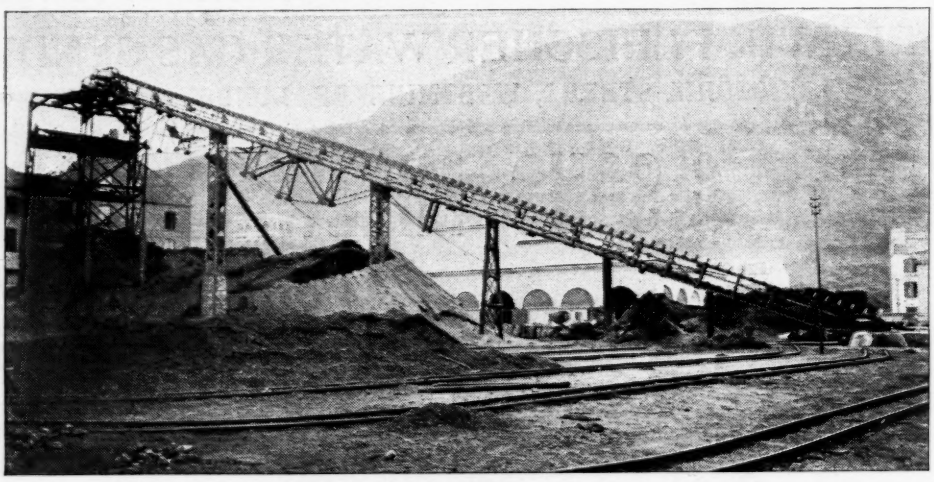

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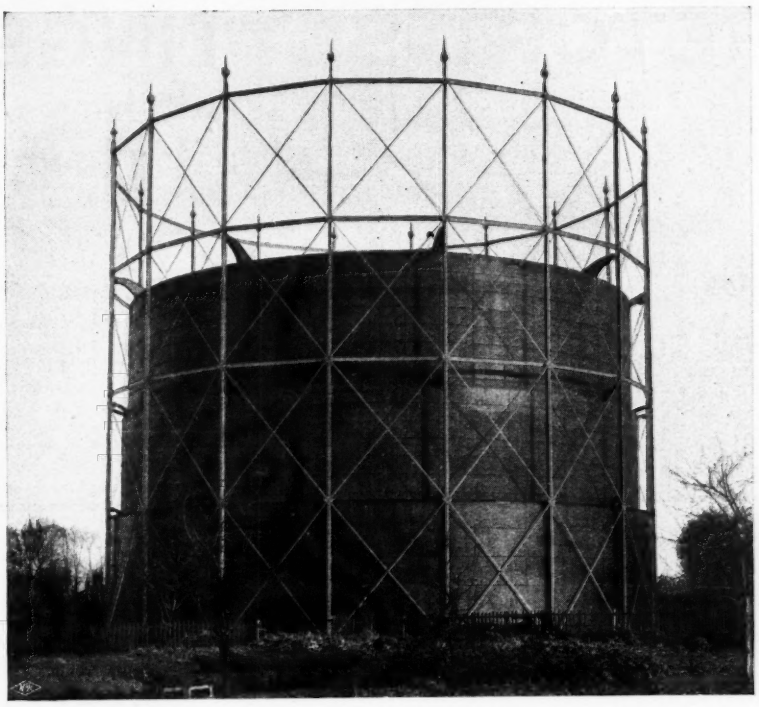
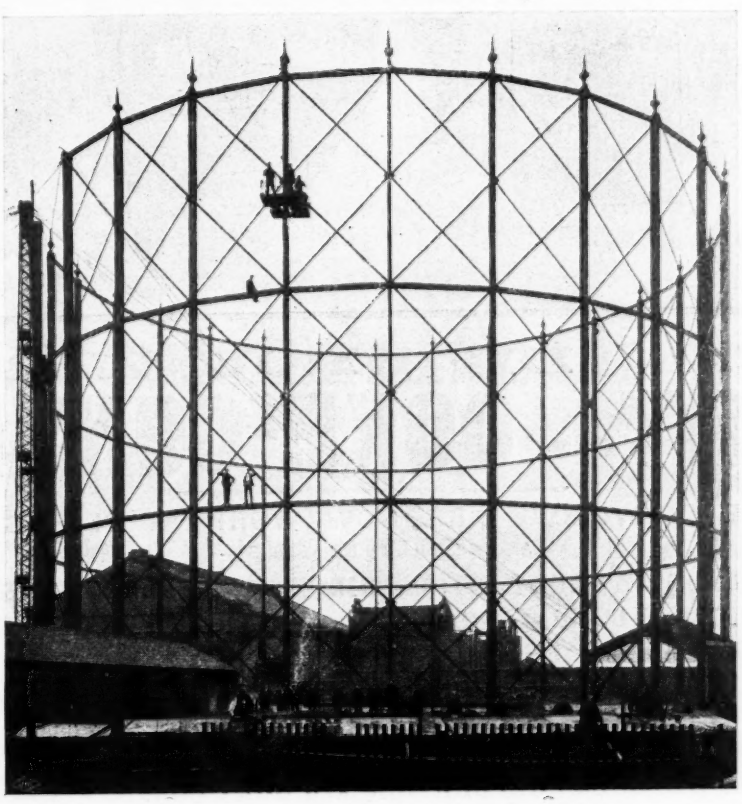


hree-Lift Gasholder and Steel Tank, 90 feet diameter by 14 feet deep, recently erected for the EPSOM GAS COMPANY.



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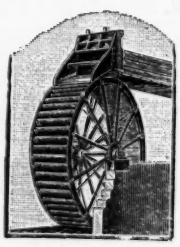

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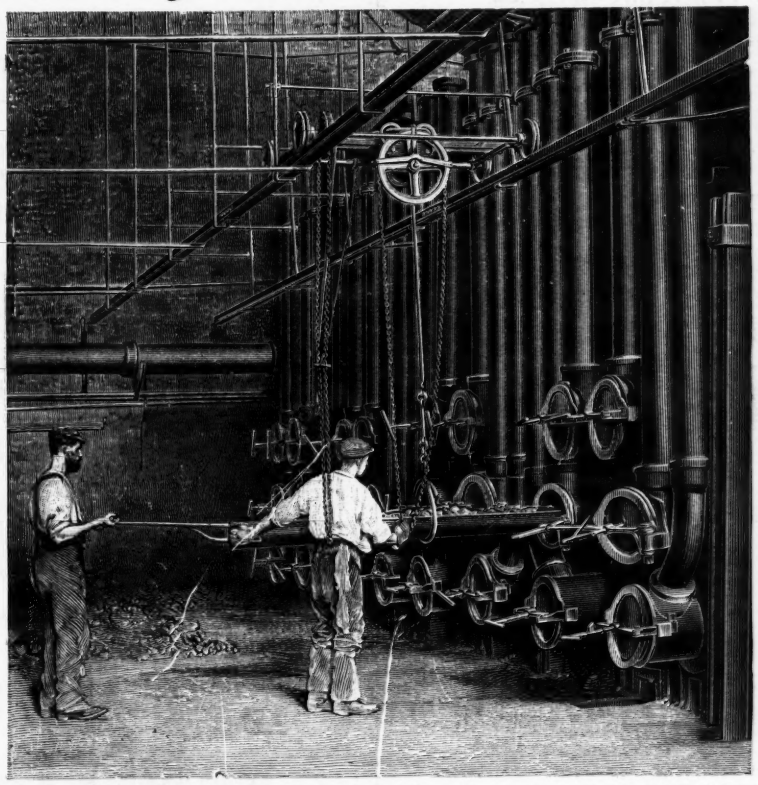

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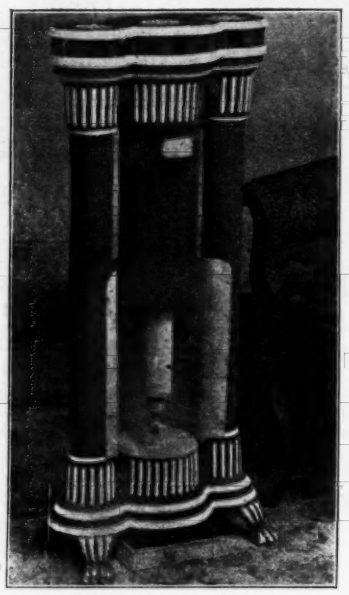

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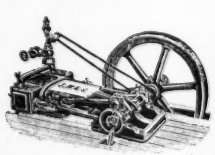

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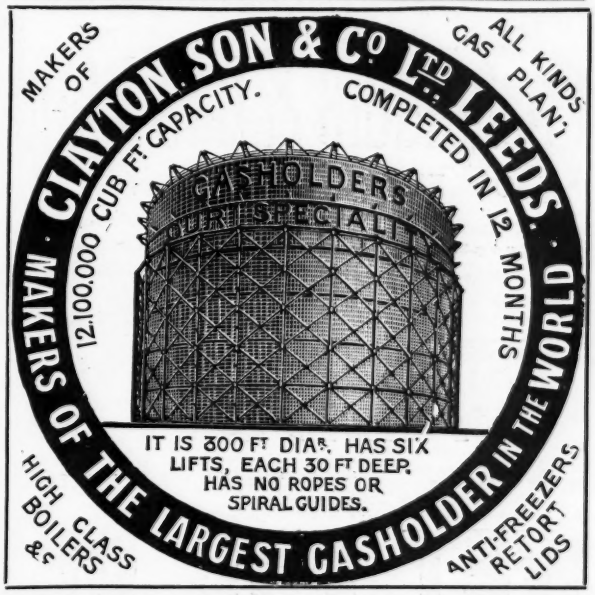
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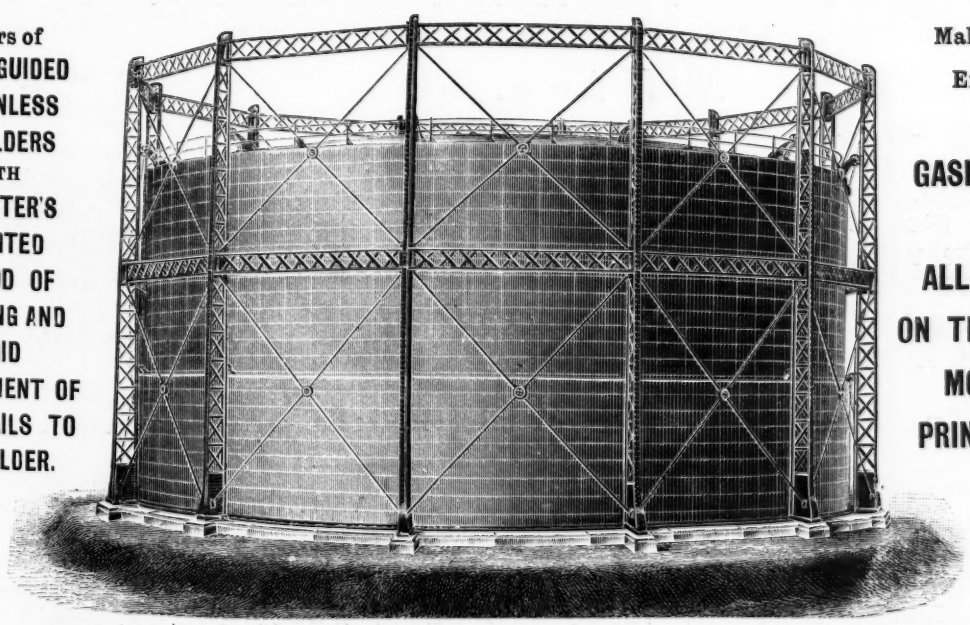

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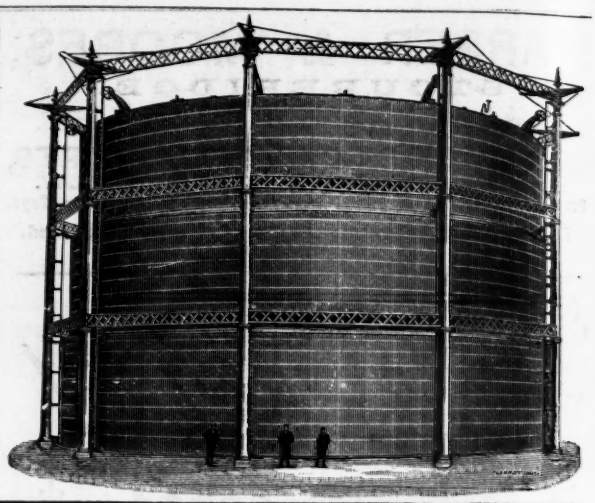

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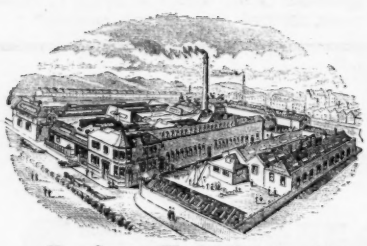

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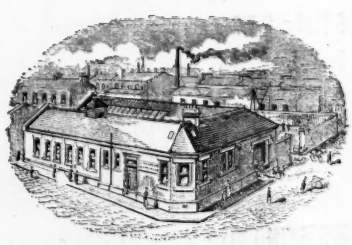

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